《失控》作者K.K.最新力作

《史蒂夫·乔布斯传》作者沃尔特·艾萨克森鼎力推荐

科技想要什么

WHAT TECHNOLOGY WANTS

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KEVIN KELLY

熊祥◎译

中信出版社 CHINACITICPRESS

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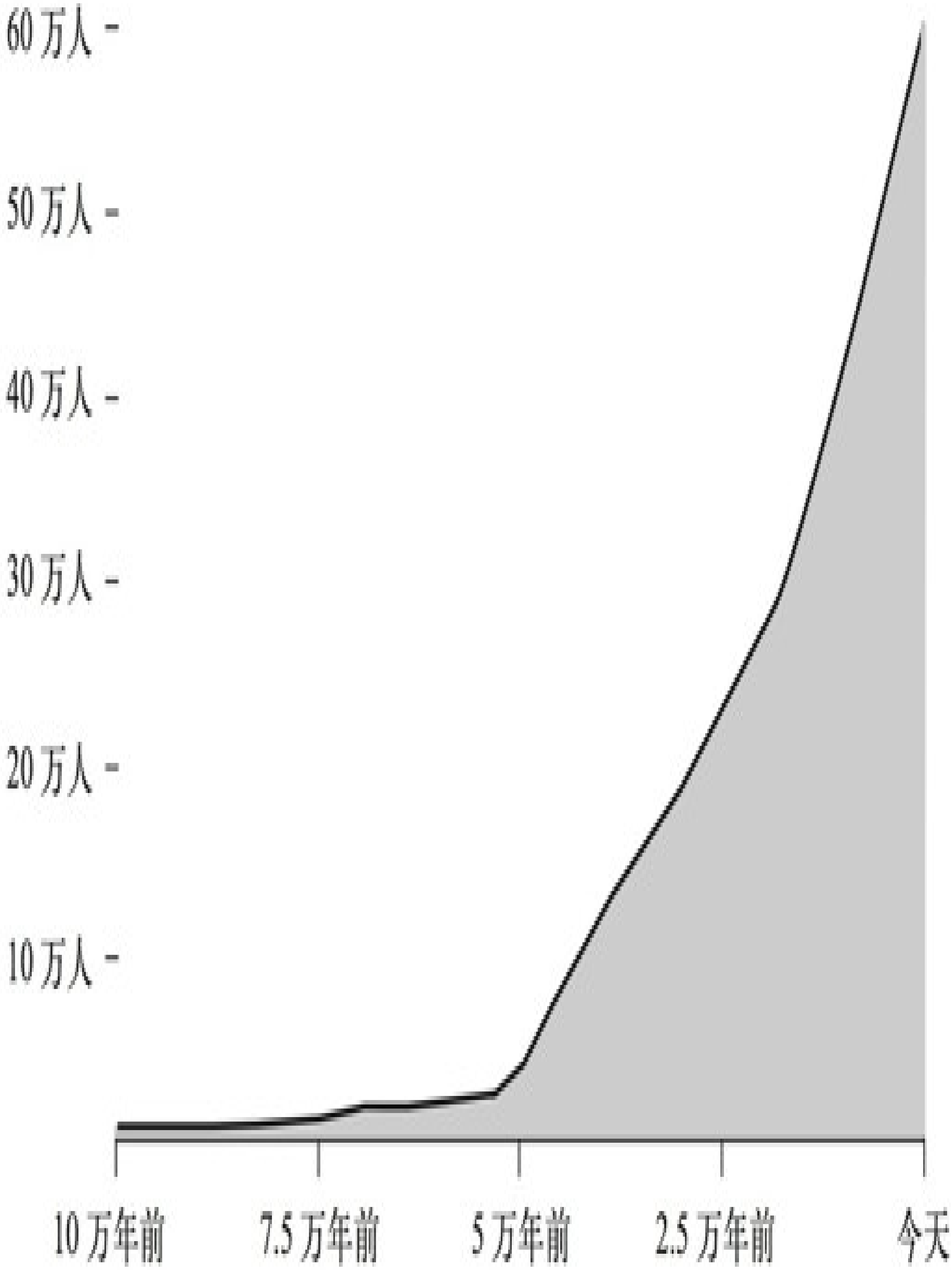
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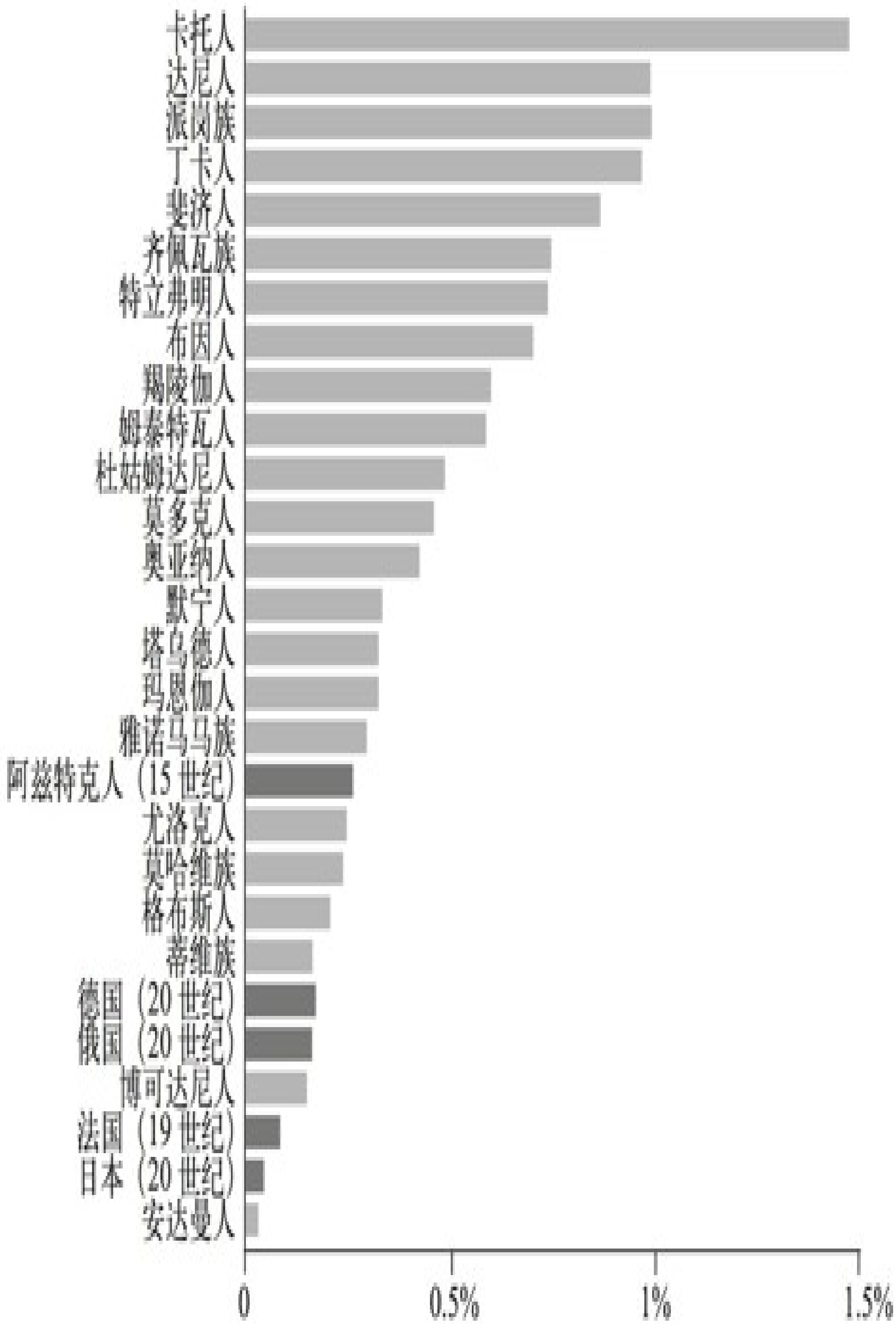
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派岗族
丁卡人
斐济人
齐佩瓦族
特立弗明人
布因人
羯陵伽人
姆泰特瓦人
杜姑姆达尼人
莫多克人
奥亚纳人
默宁人
塔乌德人
玛恩伽人
雅诺马马族
阿兹特克人（15世纪）
尤洛克人
莫哈维族
格布斯人
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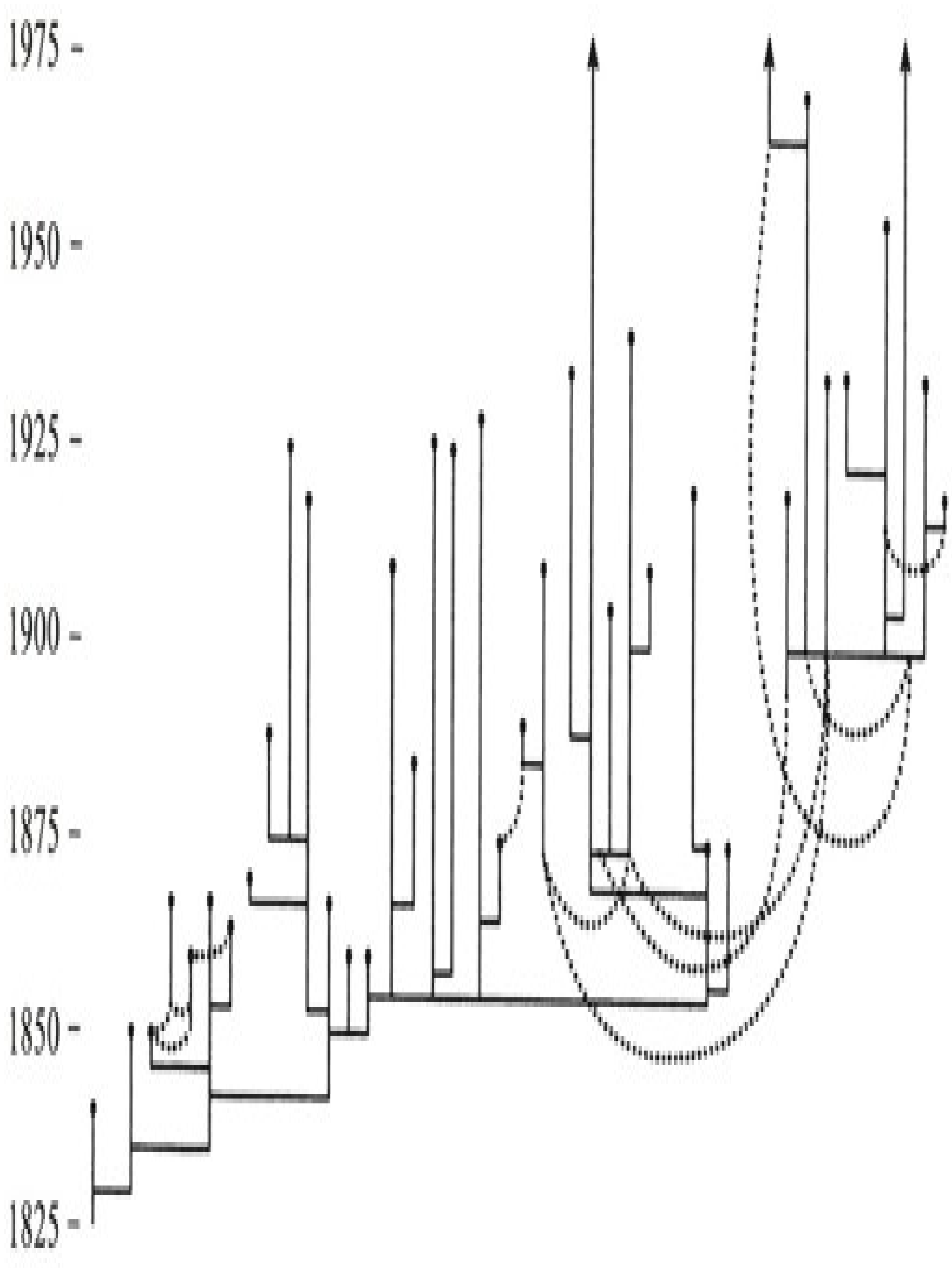
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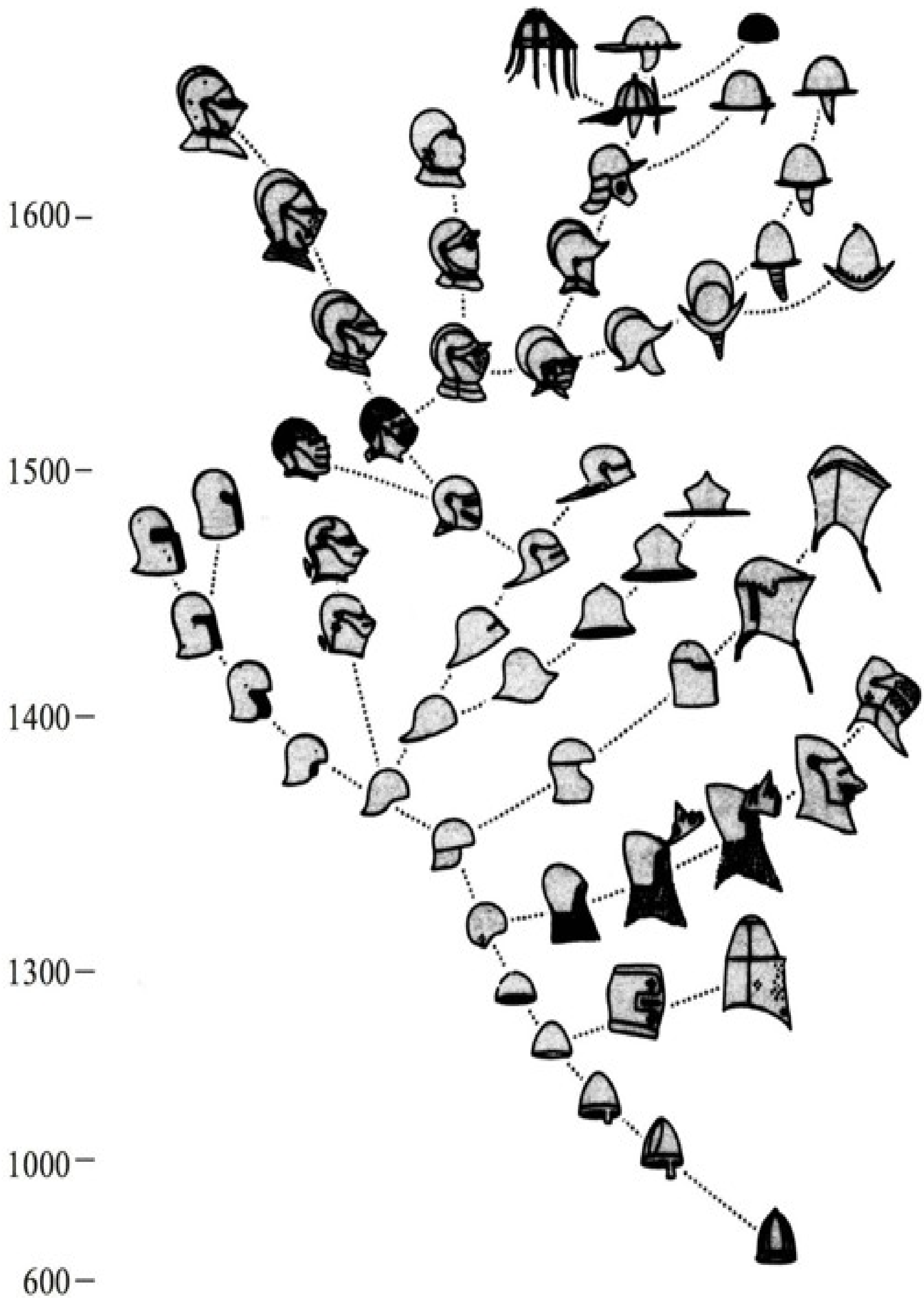
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Drag Saw Machines.

New Famous Binder.

Steel Hand Cart Wheels.

Plows.

Improved Cider Mill.

All Steel Road Scrapers.

Spray Pump—The Advance.

Lard and Wine Presses.

Fanning Mills.

Paint Mills.

Corn Shellers.

Hand Carts.

Drag Saw Machines.

Corn Sheller.

Plows

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Cider Mill.

Spray Pump – The Advance

Lard and Wine Presses.

Fanning Mills.

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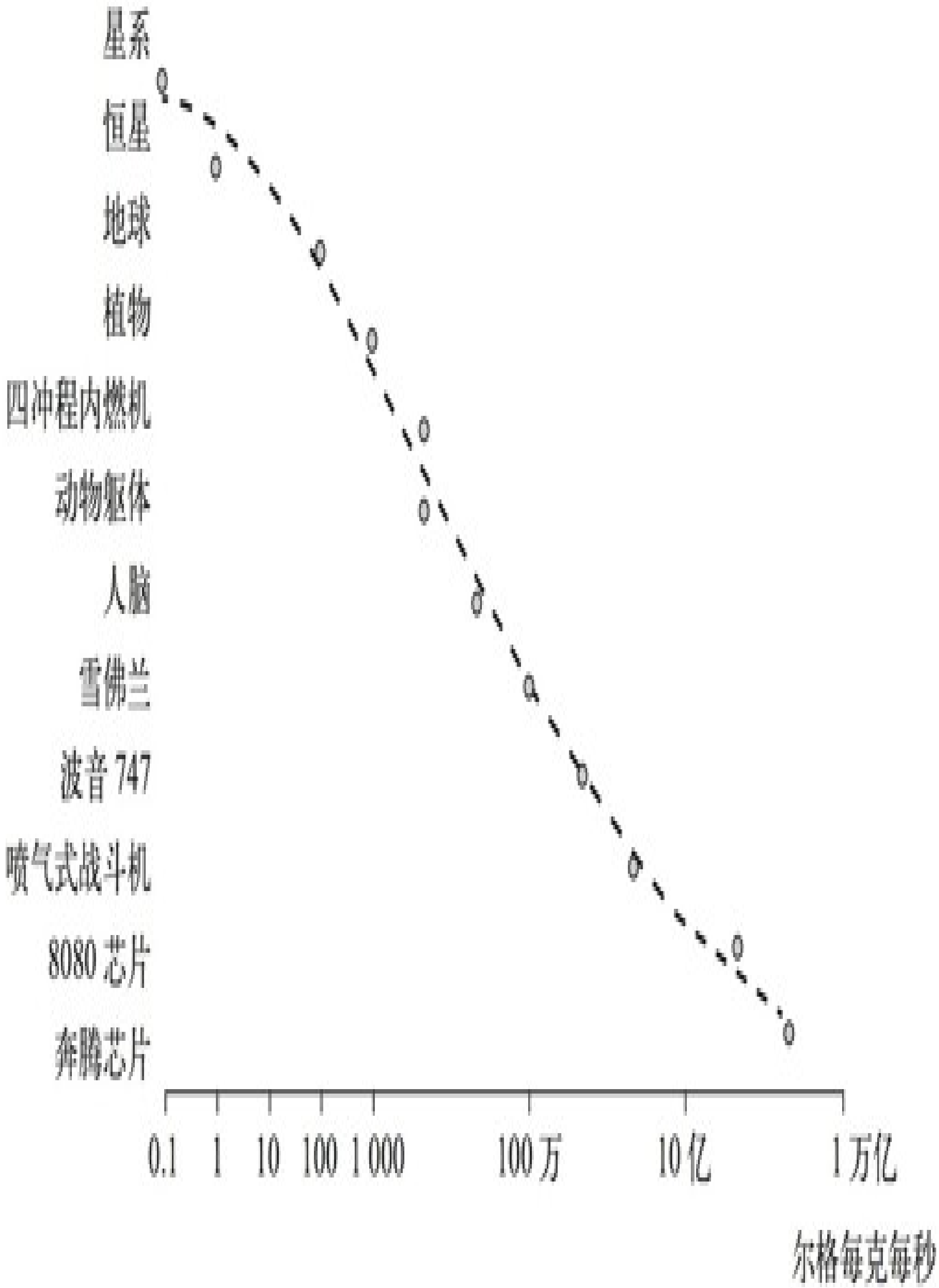
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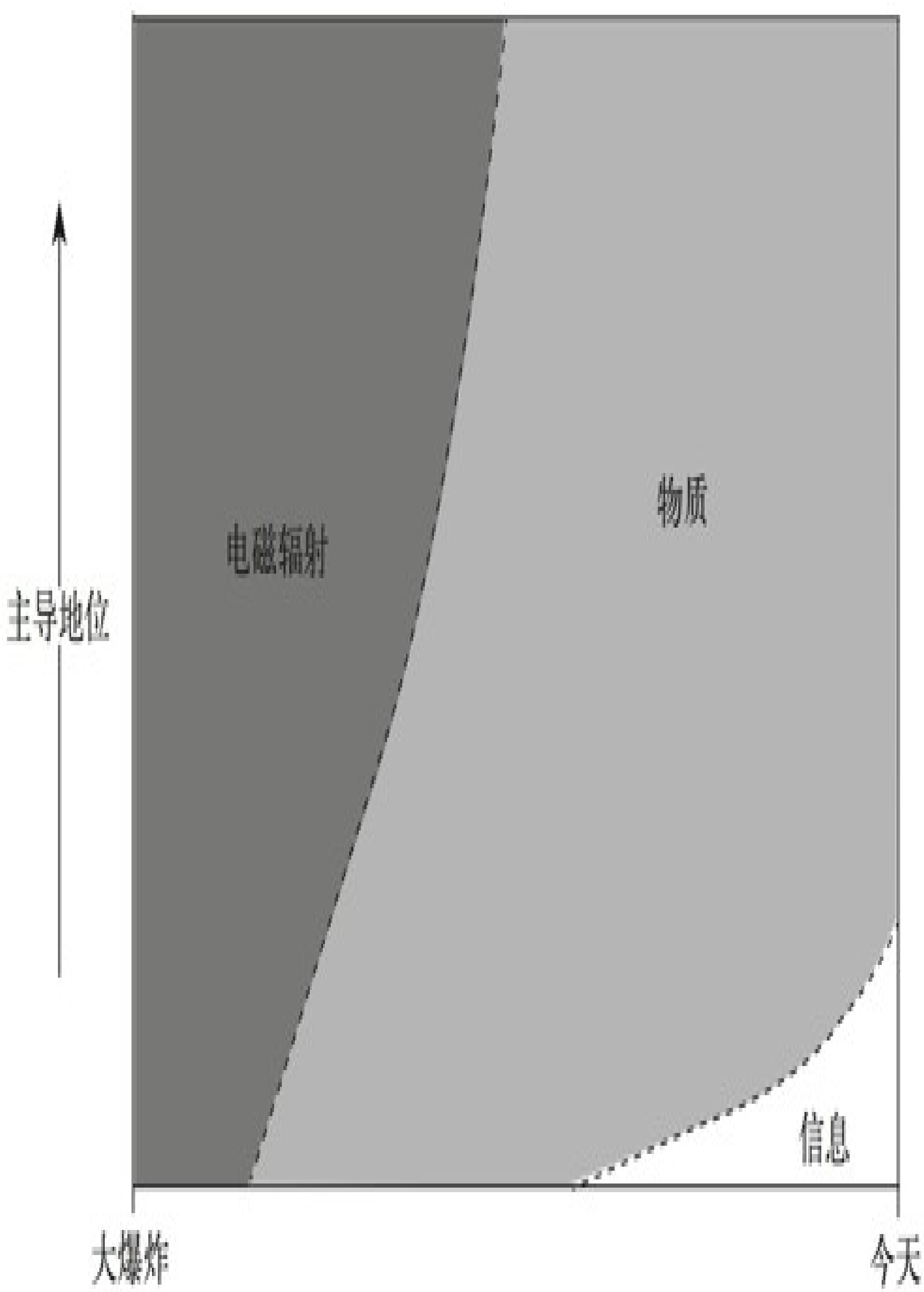
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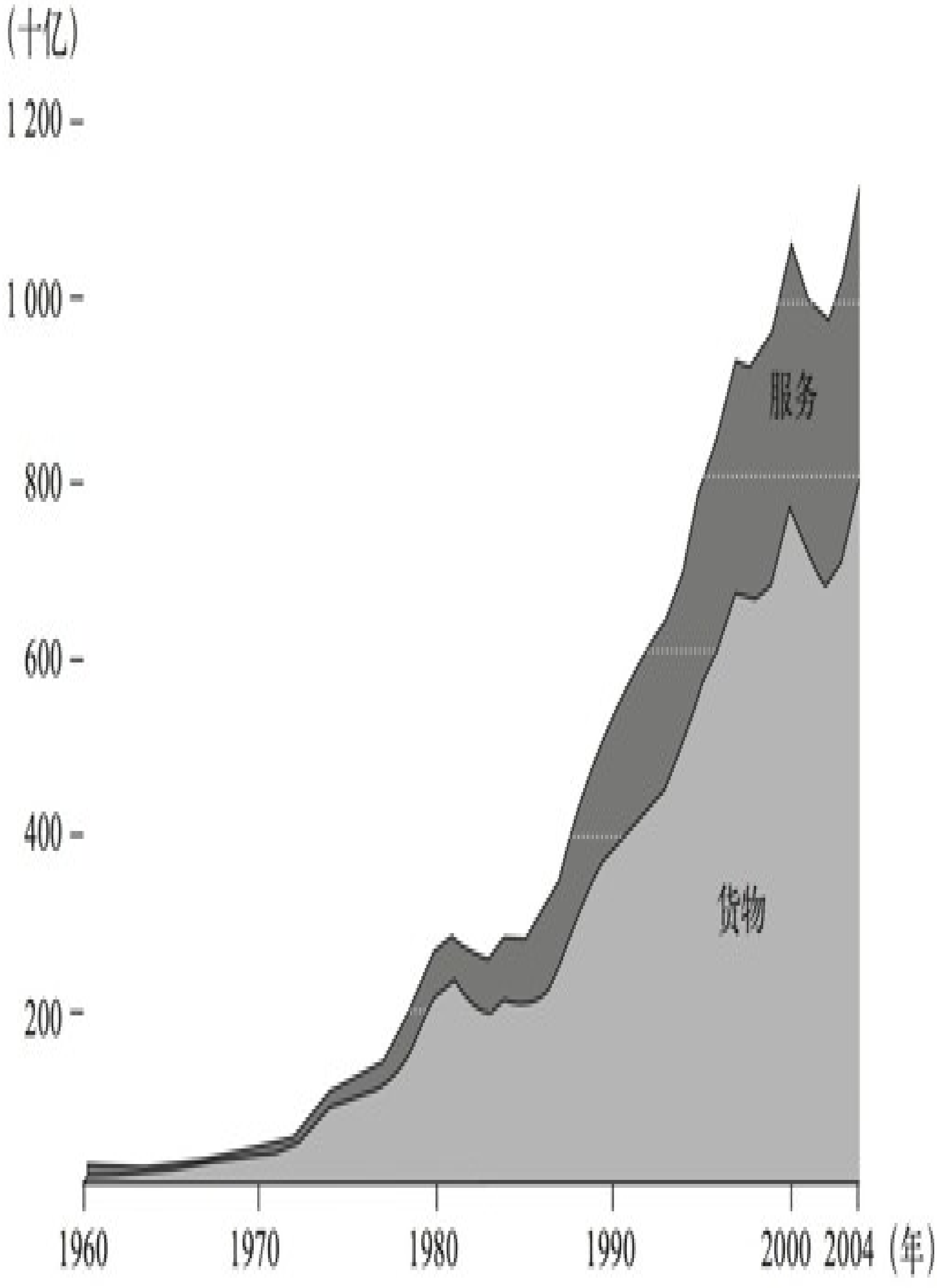
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[illegible]20[illegible]127[illegible]40[illegible]50[illegible]75[illegible]

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[illegible]30[illegible]·[illegible]1974[illegible]

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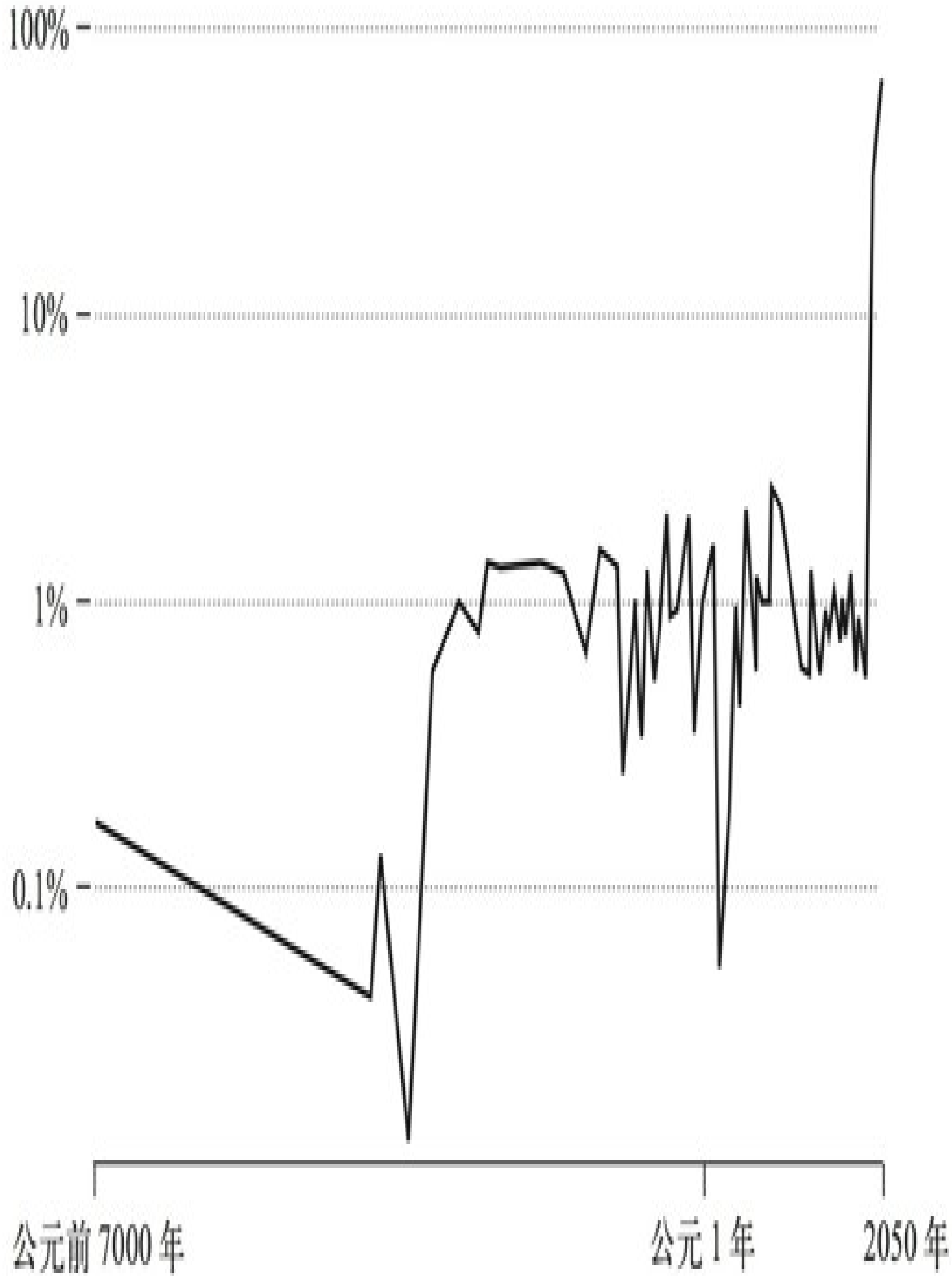
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[illegible]1000[illegible]50%[illegible]100[illegible]21[illegible]

[illegible]19[illegible]90[illegible]

[illegible]5-1[illegible]1%[illegible]2%[illegible]5-1[illegible]

[illegible]


100%
10%
1%
0.1%
公元前7000年
公元1年
2050年

[illegible]5–1 [illegible]7000[illegible]2050[illegible]

[illegible]——[illegible]——[illegible]

[illegible]·[illegible]18[illegible]80[illegible]20%[illegible]2[illegible]19[illegible]80[illegible]1[illegible]1858[illegible]90%[illegible]1[illegible]12[illegible]

[illegible]·[illegible]Shadow Cities[illegible]1855[illegible]95%[illegible]6[illegible]1940[illegible]1/5[illegible]100[illegible]21[illegible]

[illegible]

[illegible]1000[illegible]——[illegible]——[illegible]

[illegible]——[illegible]

[illegible]·[illegible]Whole Earth Discipline[illegible]40[illegible]18%[illegible]·[illegible]2/3[illegible]9/10[illegible]80%~90%[illegible]——[illegible]——[illegible]·[illegible]Planet of Slums[illegible]97%[illegible]70%[illegible]6[illegible]1.6[illegible]1.5[illegible]1[illegible]2/3[illegible]CD[illegible]1[illegible]1[illegible]1[illegible]5%[illegible]94%[illegible]

[illegible]

[illegible]Maximum City[illegible]·[illegible]

[illegible]·[illegible]·[illegible]·[illegible]80[illegible]

[illegible]

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[illegible]60[illegible]25[illegible]——[illegible]10[illegible]——[illegible]

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[illegible]500[illegible]18[illegible]1[illegible]10[illegible]12[illegible]

[illegible]

[illegible]

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——[illegible]

17[illegible]——[illegible]——[illegible]

[illegible]——[illegible]——[illegible]
1650[illegible]1650[illegible]3650[illegible]300[illegible]

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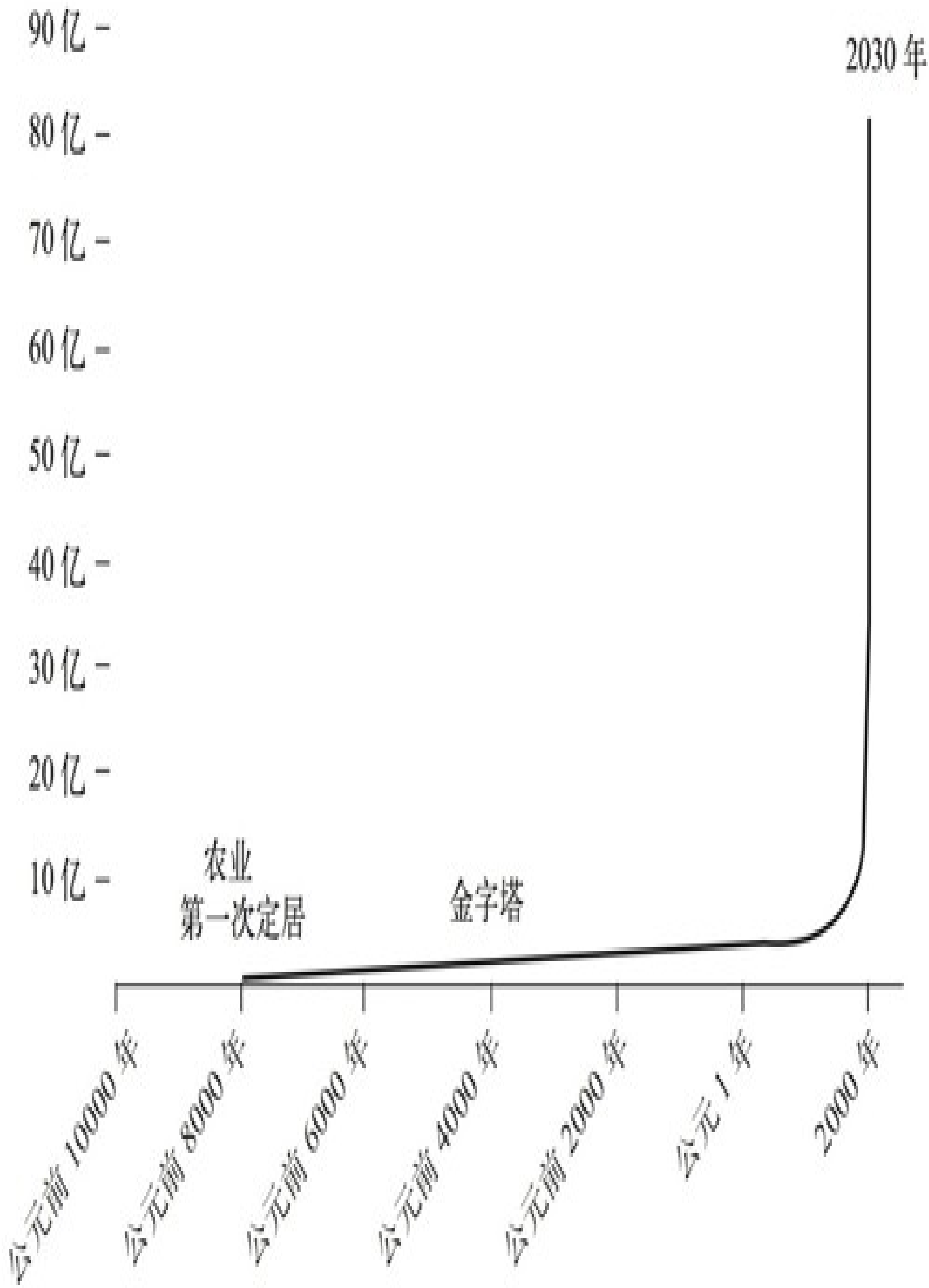
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[illegible]

[illegible]30%[illegible]



90亿
80亿
70亿
60亿
50亿
40亿
30亿
20亿
10亿
2030年
农业
第一次定居
金字塔
公元前10000年
公元前8000年
公元前6000年
公元前4000年
公元前2000年
公元1年
2000年

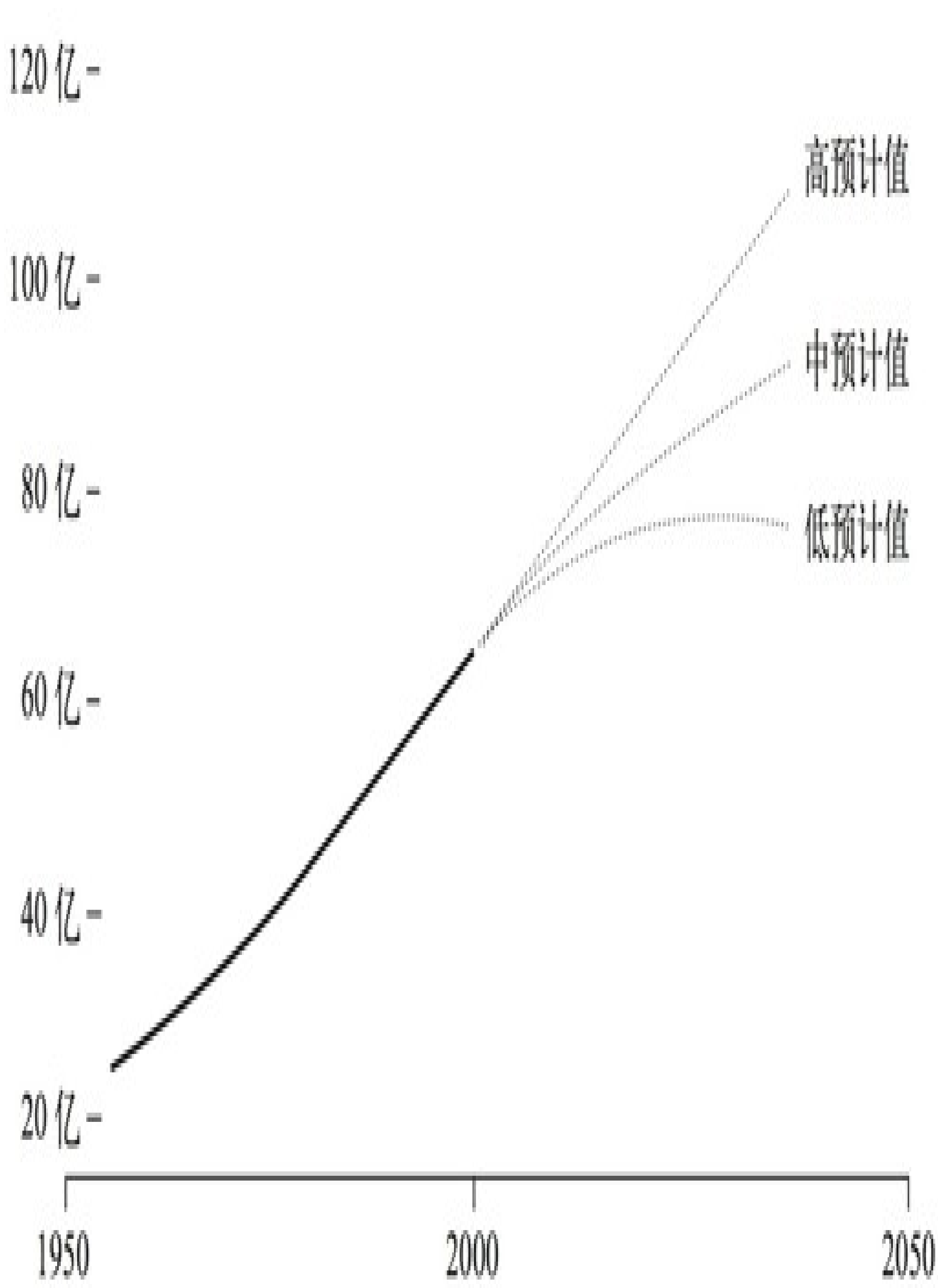
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[illegible]100[illegible]1[illegible]100[illegible]100[illegible]

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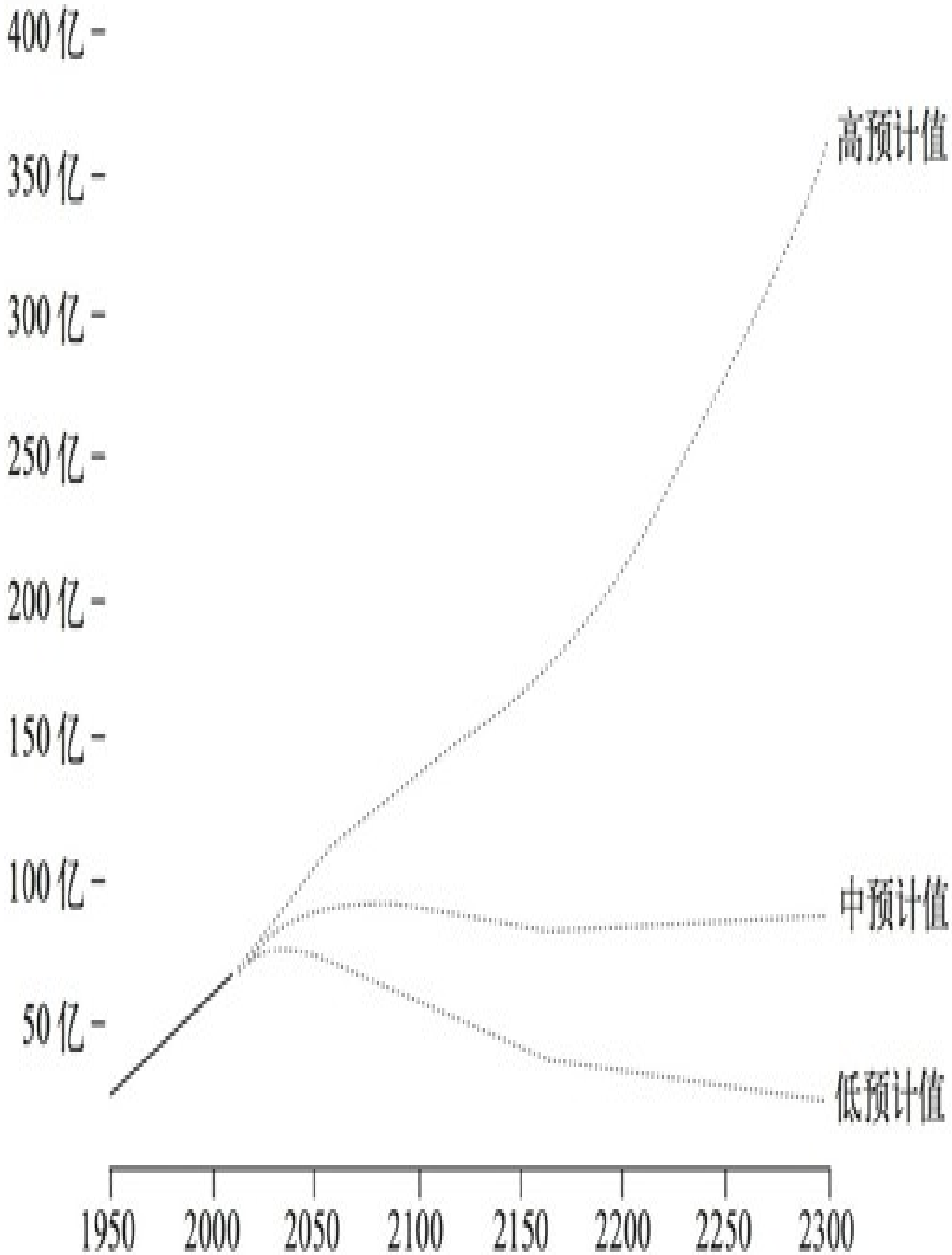


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[illegible]2050[illegible]

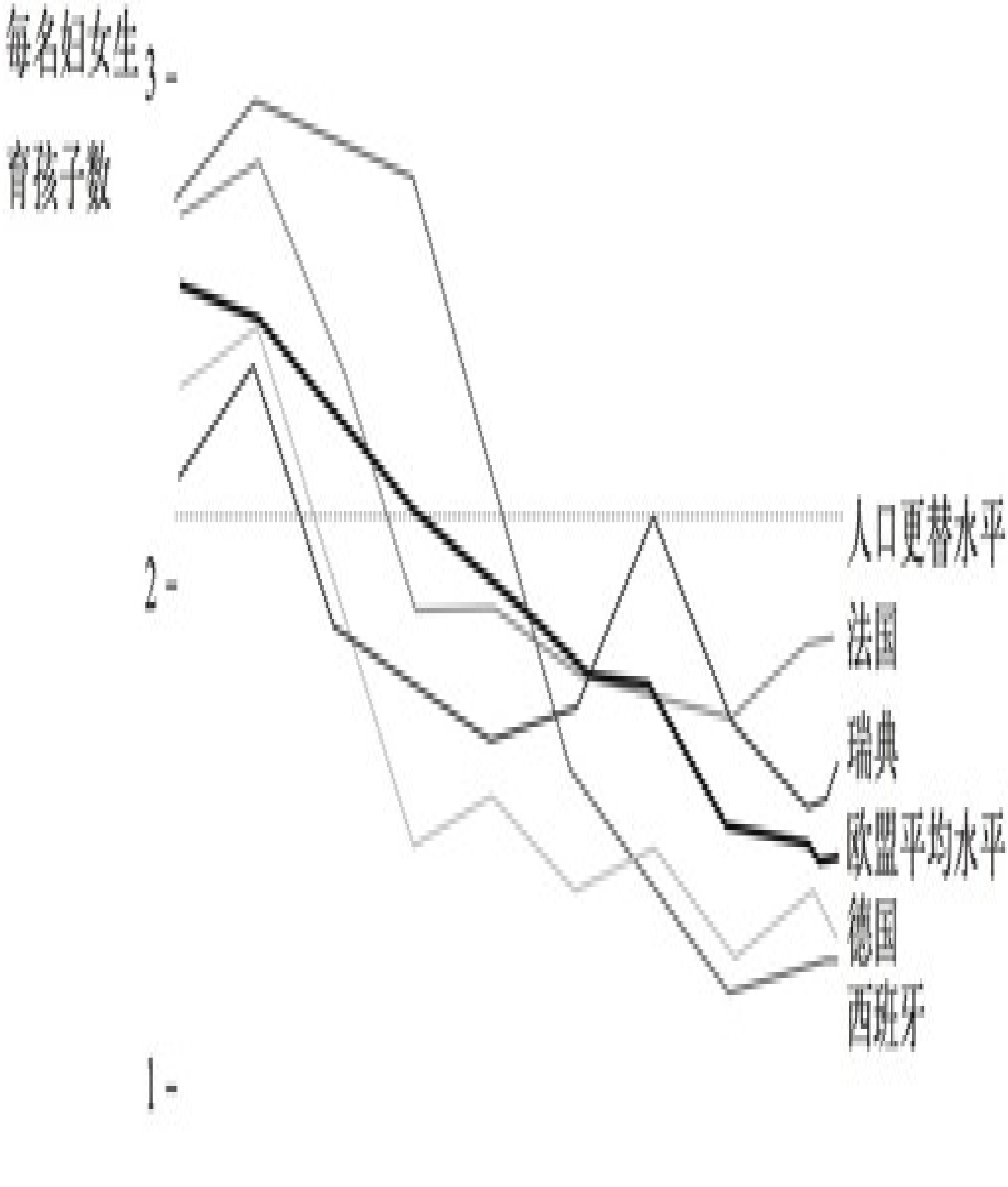
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[illegible]5–4 [illegible]300[illegible]3[illegible]2000~2300[illegible]

[illegible] 5-
5 [illegible] — [illegible]
[illegible]


每名妇女生育孩子数
3
2
1
人口更替水平
法国
瑞典
欧盟平均水平
德国
西班牙
1960
1970
1980
1990
2000

5–5

[illegible]

[illegible]2300[illegible]300[illegible]2.1[illegible]2.3[illegible]2.1[illegible]1~2[illegible]4[illegible]5[illegible]10[illegible]3[illegible]4[illegible]5[illegible]4[illegible]3[illegible]

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[illegible]5[illegible]5[illegible]

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[illegible]3[illegible]

[illegible]2

[illegible]

[illegible]3

[illegible]

[illegible]

[illegible]4

[illegible]

[illegible]5

[illegible]

[illegible]

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20[illegible]3[illegible]3[illegible]

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[illegible]

[illegible]3[illegible]3[illegible]

[illegible]10[illegible]·[illegible]

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[illegible]

[illegible]

[illegible]

[illegible]·[illegible]Matt Ridley[illegible]——[illegible]——[illegible]85[illegible]60[illegible]1950[illegible]82%[illegible]38%[illegible]

[illegible]

[illegible]

[illegible]·[illegible]·[illegible]

1. [illegible]——[illegible]

[illegible]
[illegible]

[illegible]

[illegible]

[illegible]·[illegible]

[illegible]

[illegible]

[illegible]·[illegible]

[illegible]

[illegible]·[illegible]

[illegible]

[illegible]

[illegible]40[illegible]

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[illegible]

[illegible]3000[illegible]

[illegible]—[illegible]—[illegible]3[illegible]·[illegible]Sean Carroll[illegible]

[illegible]

[illegible]3[illegible]3[illegible]3[illegible]4[illegible]1[illegible]4[illegible]6[illegible]——[illegible]3[illegible]

[illegible]

[illegible]

[illegible]——[illegible]3[illegible]75[illegible]

[illegible]·[illegible]·[illegible]

[illegible]20[illegible]

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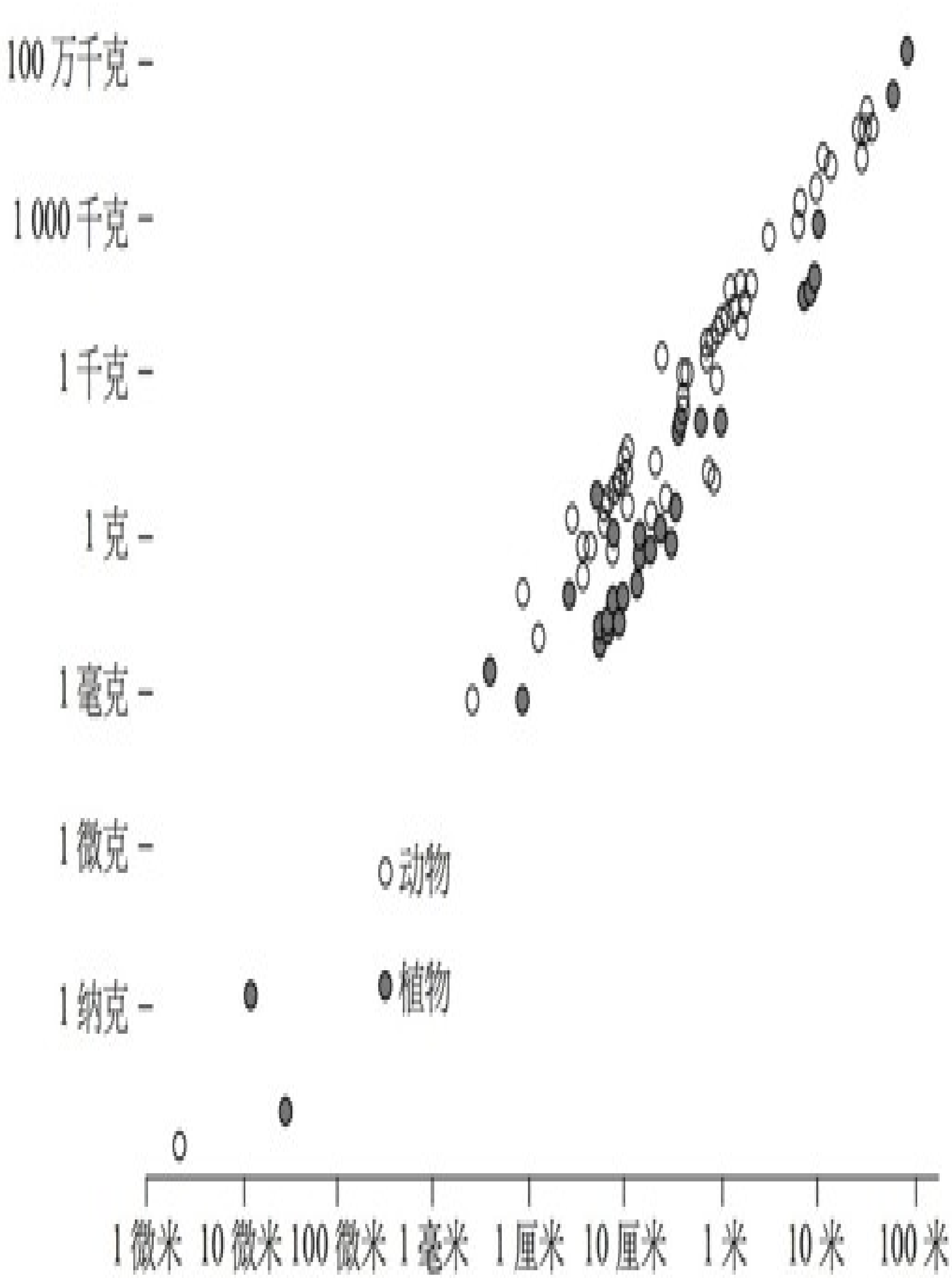
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2. [illegible]

[illegible]——[illegible]——[illegible]

[illegible]100[illegible]1[illegible]——[illegible]——[illegible]


100 万千克
1 000 千克
1 千克
1 克
1 毫克
1 微克
1 纳克
动物
植物
1 微米
10 微米
100 微米
1 毫米
1 厘米
10 厘米
1 米
10 米
100 米

[illegible]6–1 [illegible]

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[illegible]——[illegible]DNA[illegible]——[illegible]——[illegible]·[illegible]·[illegible]

[illegible]·[illegible]·[illegible]——[illegible]——[illegible]

[illegible]

[illegible]——[illegible]·[illegible]

DNA[illegible]DNA[illegible]DNA[illegible]DNA[illegible]DNA[illegible]DNA[illegible]20

[illegible]

[illegible]——[illegible]——[illegible] DNA [illegible] DNA [illegible]——[illegible]——[illegible] DNA [illegible]

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[illegible]

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[illegible]
8[illegible]——[illegible]——[illegible]

[illegible]

[illegible]·[illegible]·[illegible]DNA
[illegible]·[illegible]Norman Pace[illegible]
[illegible]20[illegible]
[illegible]·[illegible]DNA[illegible]

[illegible]DNA[illegible]——[illegible]·[illegible]
[illegible]Stephen Freeland[illegible]·[illegible]Laurence Hurst[illegible]——[illegible]
[illegible]DNA[illegible]DNA[illegible]2.7
[illegible]100[illegible]
[illegible]100[illegible]
[illegible]DNA[illegible]100[illegible]DNA[illegible]

[illegible]·[illegible]

[illegible]——[illegible]

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[illegible]——[illegible]
[illegible]DNA[illegible]
DNA[illegible]
[illegible]DNA[illegible]DNA[illegible]

[illegible]·[illegible]·[illegible]

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[illegible]

[illegible]

[illegible]——[illegible]——[illegible]

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[illegible]L·H·[illegible]L. H. Caporale[illegible]W·B·[illegible]W. B. Scott[illegible]

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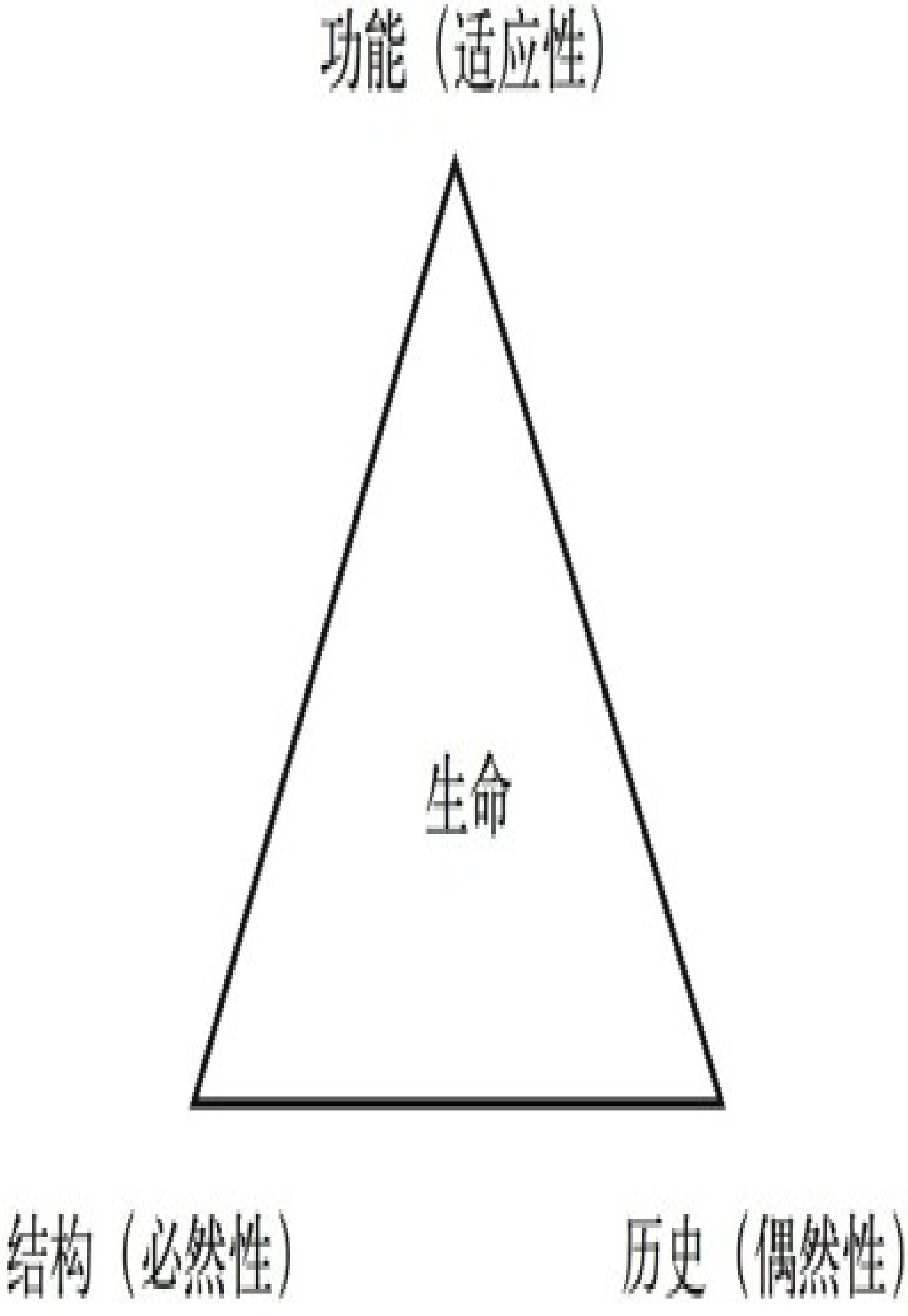
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[illegible]12[illegible]



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[illegible]·[illegible]·[illegible]——[illegible]

[illegible]

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[illegible]

[illegible]·[illegible]

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[illegible]

[illegible]

[illegible]

[illegible]

[illegible]·[illegible]·[illegible]

[illegible]

[illegible]
2009[illegible]·[illegible]200[illegible]
[illegible]·[illegible]·[illegible]Alfred Russel Wallace[illegible]——150[illegible]——

[illegible]·[illegible]150[illegible]

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1901[illegible]The Age of Electricity[illegible]·[illegible]Park Benjamin[illegible]4[illegible]1611[illegible]6[illegible]3[illegible]·[illegible]Edward Jenner[illegible]4[illegible]4[illegible]3[illegible]·[illegible]Joseph Henry[illegible]·[illegible]Samuel Morse[illegible]·[illegible]William Cooke[illegible]·[illegible]Charles Wheatstone[illegible]·[illegible]Karl Steinheil[illegible]·[illegible]Louis Daguerre[illegible]3[illegible]——[illegible]·[illegible]Nicephore Niepce[illegible]·[illegible]Hercules Florence[illegible]·[illegible]·[illegible]·[illegible]William Henry Fox Talbot[illegible]——[illegible]——[illegible]·[illegible]John Napier[illegible]·[illegible]Henry Briggs[illegible]·[illegible]Joost Burgi[illegible]3[illegible]1846[illegible]3[illegible]3[illegible]1[illegible]

[illegible]·[illegible]·[illegible]1420~1901[illegible]6[illegible]

·1900

1546 2 3 4 5

6 6

DNA

· ·

30

10

1948

· ·

——— 1941 ——— · Konrad Zuse

1977

·

Alfred Kroeber

7

·

Spencer Weart 6

3

[illegible]——6[illegible]——[illegible]

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[illegible]1/3[illegible]1/3[illegible]

[illegible]·[illegible]Mark Lemley[illegible]·[illegible]Adam Jaffe[illegible]45%[illegible]6[illegible]70%[illegible]1[illegible]

[illegible]

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[illegible]



[illegible]7–1 [illegible]3[illegible]

200

Nathan Myhrvold —— —— 1000 2009 4 · Malcolm Gladwell

20% 1/3

· Jey Walker 20 —— —— 100% 2/3 1/3 ……

10 1 1/10 1/10 1 7-1

[illegible]7-1[illegible]

[illegible]

10000~1000[illegible]

1000[illegible]

100[illegible]

10[illegible]

1[illegible]

发明人数	阶段	任务	举例
10 000~1 000	思考可能性	意识到实现机会	我们应该用电照明
1 000	如何实现	设想方案的关键因素	密封玻璃泡内的白炽金属丝
100	具体细节	选择具体实现方案	焊成一体的钨丝，真空泵，焊接排气口
10	工作设备	证明解决方案确实可行	斯旺、拉迪莫、爱迪生、[illegible]等人的样机
1	实际应用	说服世界接受你的成果	爱迪生的灯泡（和电力系统）

[illegible]100%[illegible]1/10000[illegible]

[illegible]71[illegible]

[illegible] 1905 [illegible] Hendrik Lorentz [illegible] 1905 [illegible] 1904 [illegible] Henry Poincare [illegible] 1911 [illegible] Wilhelm Wien [illegible] 1912 [illegible] —— [illegible] Einstein: His Life and Universe [illegible] —— [illegible] 10 [illegible] 10 [illegible]

[illegible]

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[illegible] Tad Friend [illegible]

> [illegible] 1 [illegible] Stephen Kessler [illegible] Michael Crichton [illegible] Toto [illegible] Dorothy [illegible] Toto [illegible]

[illegible] J·K· [illegible] 1997 [illegible] 13 [illegible] 1990 [illegible] 12 [illegible] 1991 [illegible] 1994 [illegible] 13 [illegible] The Secret of Platform 13 [illegible] J·K· [illegible] — [illegible]

[illegible]

[illegible] 3 [illegible]

1. [illegible]
2. [illegible]
3. [illegible]

[illegible] — [illegible]

[illegible] 5 [illegible] 1000 [illegible] 4 [illegible] — [illegible] — [illegible]

[illegible] — [illegible] 20000 [illegible] 10000 [illegible] — [illegible]

[illegible]——[illegible]3[illegible]——[illegible]2000[illegible]——[illegible]——[illegible]

[illegible]——[illegible]



[illegible]7–2 [illegible]

[illegible]4[illegible]·[illegible]12000[illegible]60[illegible]—[illegible]·[illegible]·[illegible]

[illegible]1400[illegible]—[illegible]

[illegible]

[illegible]·[illegible]Neil Roberts[illegible]4[illegible]·[illegible]500[illegible]3[illegible]—[illegible]—[illegible]6[illegible]

[illegible]·[illegible]John Troeng[illegible]53[illegible]2[illegible]3[illegible]3[illegible]/[illegible]22[illegible]4[illegible]4[illegible]

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[illegible]·[illegible]Michele McGinnis[illegible]—[illegible]—[illegible]5[illegible]

[illegible]83[illegible]

[illegible]

[illegible]1450[illegible]1876[illegible]·[illegible]

[illegible]——[illegible]——[illegible]200[illegible]·[illegible]·[illegible]

[illegible]·[illegible]1865[illegible]35[illegible]3[illegible]——[illegible]·[illegible]·[illegible]·[illegible]·[illegible]——[illegible]6[illegible]3[illegible]

[illegible]100%[illegible]

[illegible]

[illegible] 5% [illegible] — [illegible]

[illegible]

[illegible] DNA [illegible]

[illegible]

1. [illegible]·[illegible]2000[illegible]——[illegible]

[illegible] [illegible]
[illegible]

20[illegible]
DNA[illegible]

20[illegible]50[illegible]
1903[illegible]50[illegible]
50[illegible]—[illegible]1969[illegible]

[illegible]46[illegible]1965[illegible]

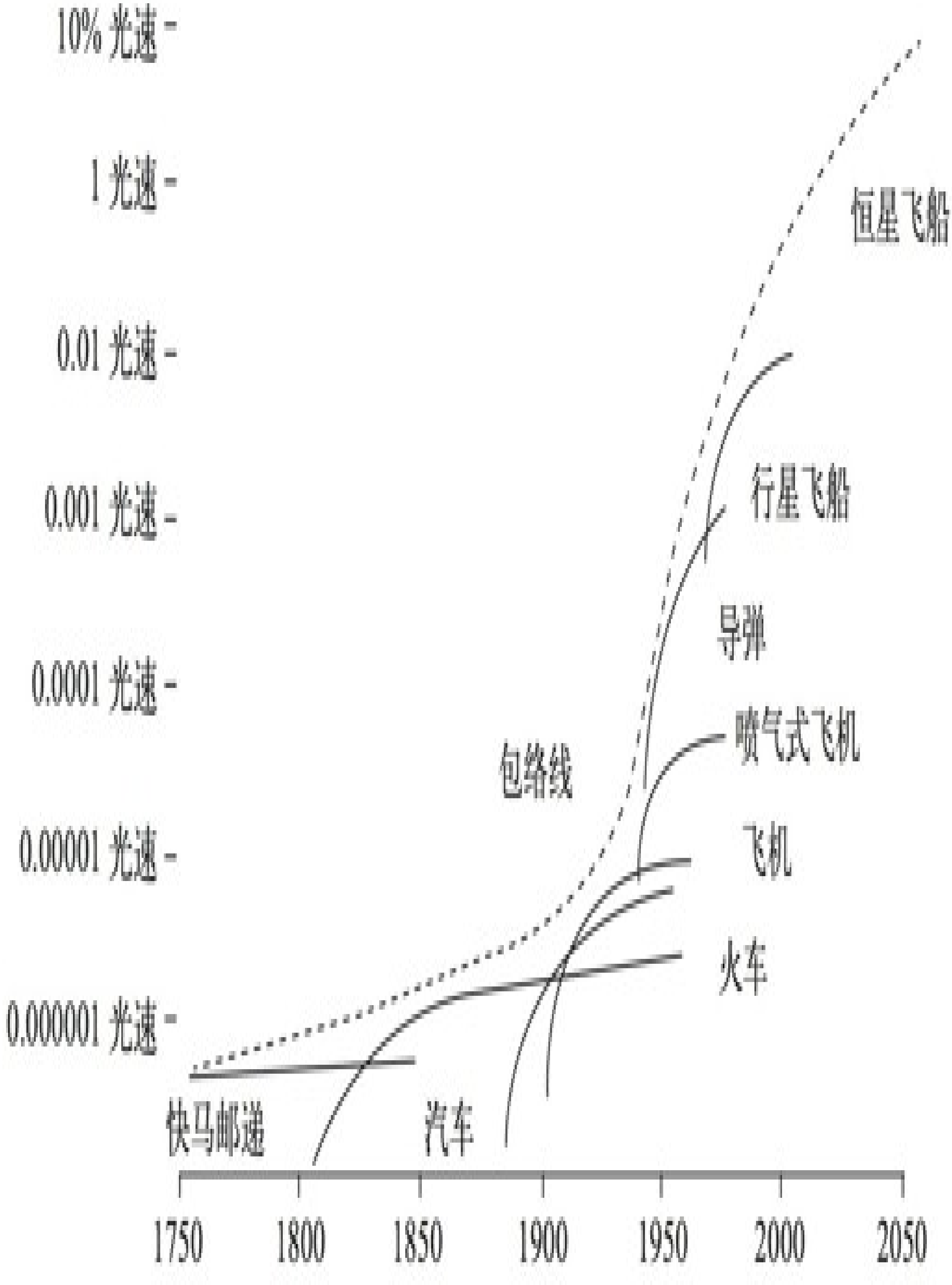
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20[illegible]50[illegible]

[illegible]1953[illegible]1903[illegible]6.8[illegible]60[illegible]1947[illegible]·[illegible]1 000[illegible]1953[illegible]F-100[illegible]1215[illegible]The Spike[illegible]·[illegible]4[illegible]……[illegible]


10% 光速
1 光速
0.01 光速
0.001 光速
0.0001 光速
0.00001 光速
0.000001 光速
恒星飞船
行星飞船
导弹
喷气式飞机
包络线
飞机
火车
快马邮递
汽车
1750
1800
1850
1900
1950
2000
2050

[illegible]8–1 [illegible]20[illegible]50[illegible]

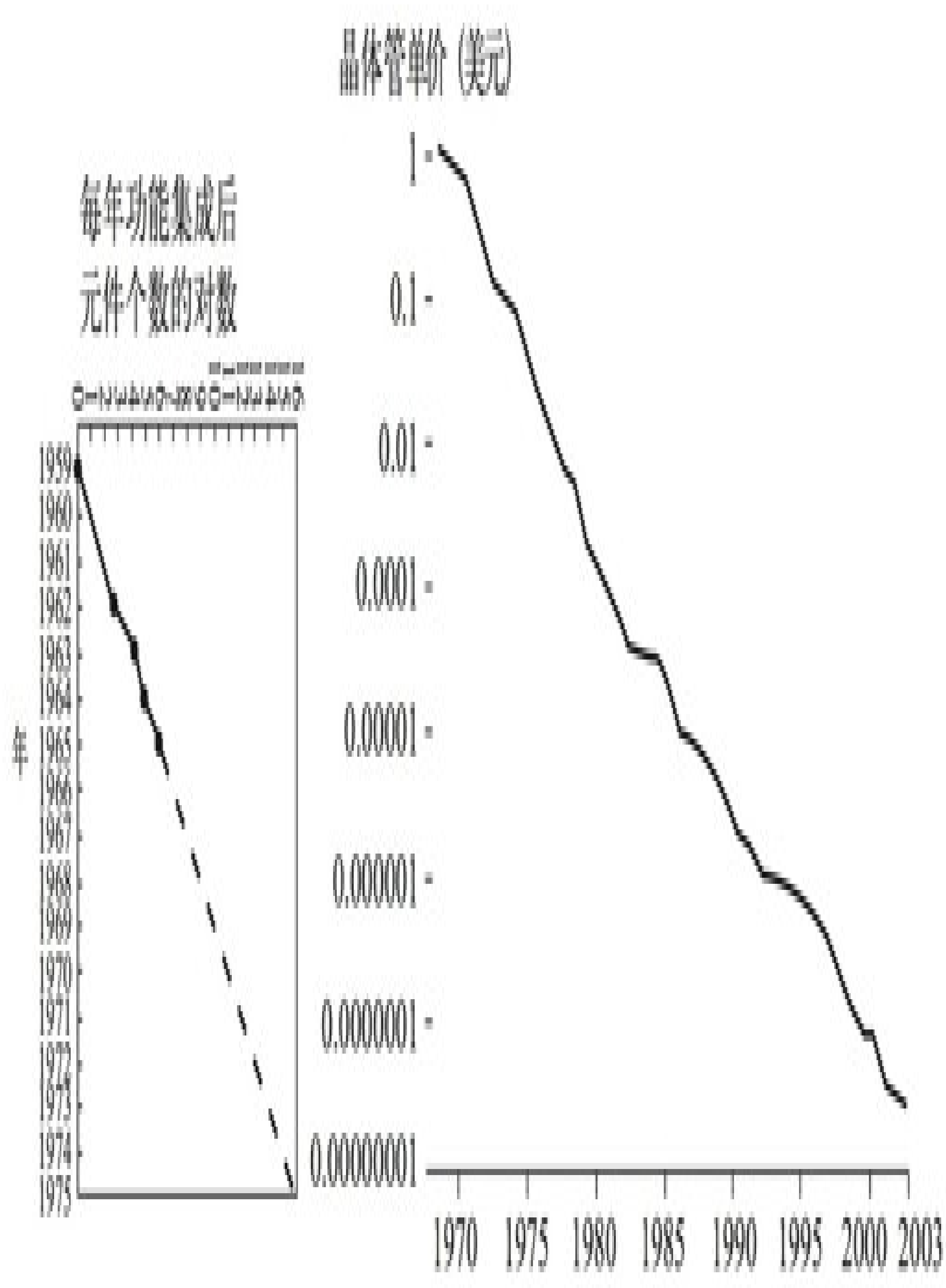
1953[illegible]2000[illegible]1957[illegible]12[illegible]·C·[illegible]1/3[illegible]

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1960[illegible]·[illegible]Doug Engelbart[illegible]——[illegible]——[illegible]——[illegible]1960[illegible]·[illegible]

[illegible]1964[illegible]——[illegible]


晶体管单价（美元）
1
0.1
0.01
0.0001
0.00001
0.000001
0.0000001
0.00000001
1970
1975
1980
1985
1990
1995
2000
2003
每年功能集成后
元件个数的对数
年
1959
1960
1961
1962
1963
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975

[illegible]8–2 [illegible]5[illegible]10[illegible]
[illegible]1968[illegible]

[illegible]·[illegible]1967[illegible]

[illegible]50[illegible]10[illegible]21[illegible]50[illegible]

[illegible]50[illegible]

[illegible]2005[illegible]40[illegible]·[illegible]

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[illegible]·[illegible]·[illegible]1996[illegible]3[illegible]

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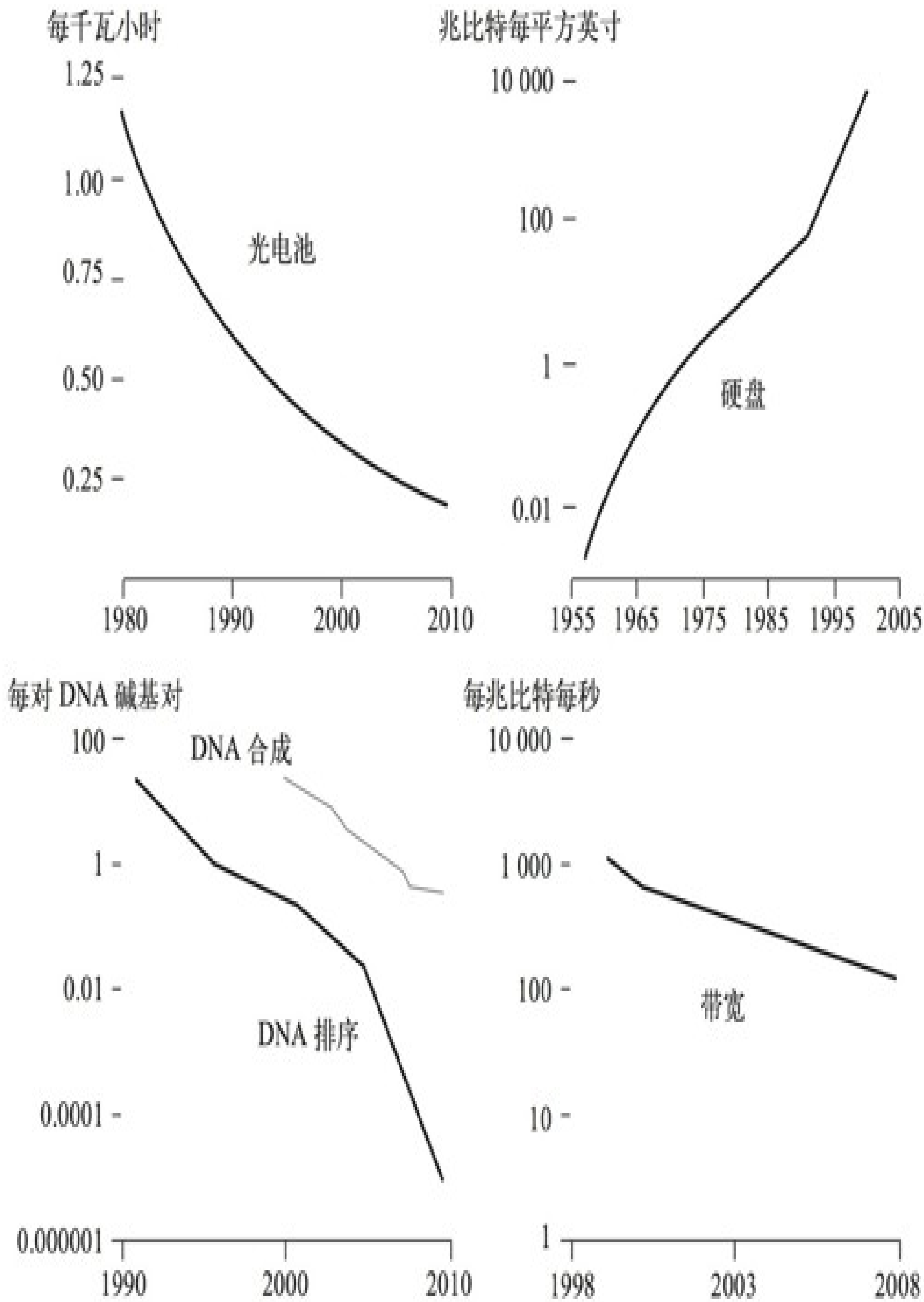
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[illegible]·[illegible]Larry Roberts[illegible]

[illegible]10[illegible]·[illegible]Rob Carlson[illegible]DNA[illegible]DNA[illegible]DNA[illegible]DNA[illegible]

[illegible]3[illegible]3[illegible]——[illegible]——[illegible]

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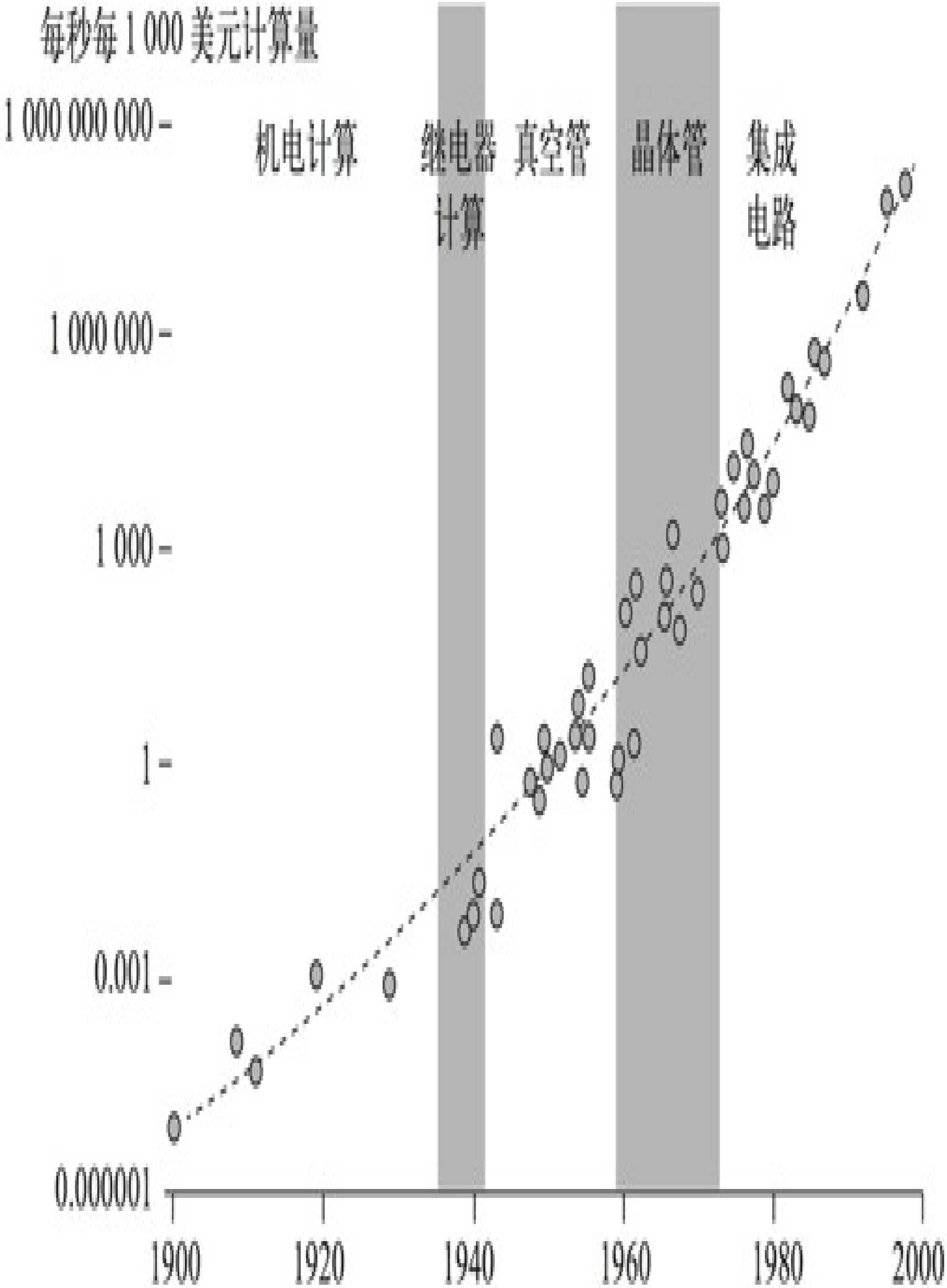


每千瓦小时
1.25
1.00
0.75
0.50
0.25
光电池
1980
1990
2000
2010
兆比特每平方英寸
10 000
100
1
0.01
硬盘
1955
1965
1975
1985
1995
2005
每对 DNA 碱基对
100
1
0.01
0.0001
0.000001
DNA 合成
DNA 排序
1990
2000
2010
每兆比特每秒
10 000
1 000
100
10
1
带宽
1998
2003
2008

[illegible]8–3 [illegible]4[illegible]DNA[illegible]DNA[illegible]

[illegible]

[illegible]·[illegible]1900[illegible]1000[illegible]109[illegible]5[illegible]5[illegible]100[illegible]


每秒每1 000美元计算量
1 000 000 000
1 000 000
1 000
1
0.001
0.000001
机电计算
继电器
计算
真空管
晶体管
集成
电路
1900
1920
1940
1960
1980
2000

[illegible]8–4 [illegible]·[illegible]

[illegible]DNA[illegible]

[illegible]1[illegible]

[illegible]·[illegible]500[illegible]20[illegible]5[illegible]

[illegible]

技术	度量依据	月份数
光导纤维容量	单模纤维工作波长	9
光纤网络	每比特耗费美元	9
无线传输	每秒比特量	10
通信	一美元产生比特量	12
磁存储密度	每平方英寸含千兆位	12
数码相机	一美元产生像素量	12
微处理器	单周期耗费美元	13
超级计算机能力	浮点八进制	14
RAM	一美元产生兆位	16
晶体管	单支晶体管成本	18
CPU 耗电量	每平方厘米耗费瓦特	18
像素	单个阵列含像素量	19
硬盘存储	一美元产生的千兆位	20
芯片	每秒百万条指令	21
DNA 排序	单对碱基对耗费美元	22
中继链接数据速度	每秒比特量	22
微处理器	单块芯片晶体管数	24
单片机	一美元产生的兆赫	27
带宽	每秒耗费一美元产生千兆	30
微处理器	赫兹	36

8-1

[illegible]—[illegible]—[illegible] 8~30 [illegible] 18 [illegible]·[illegible] 5 [illegible] 10 [illegible] 18 [illegible]

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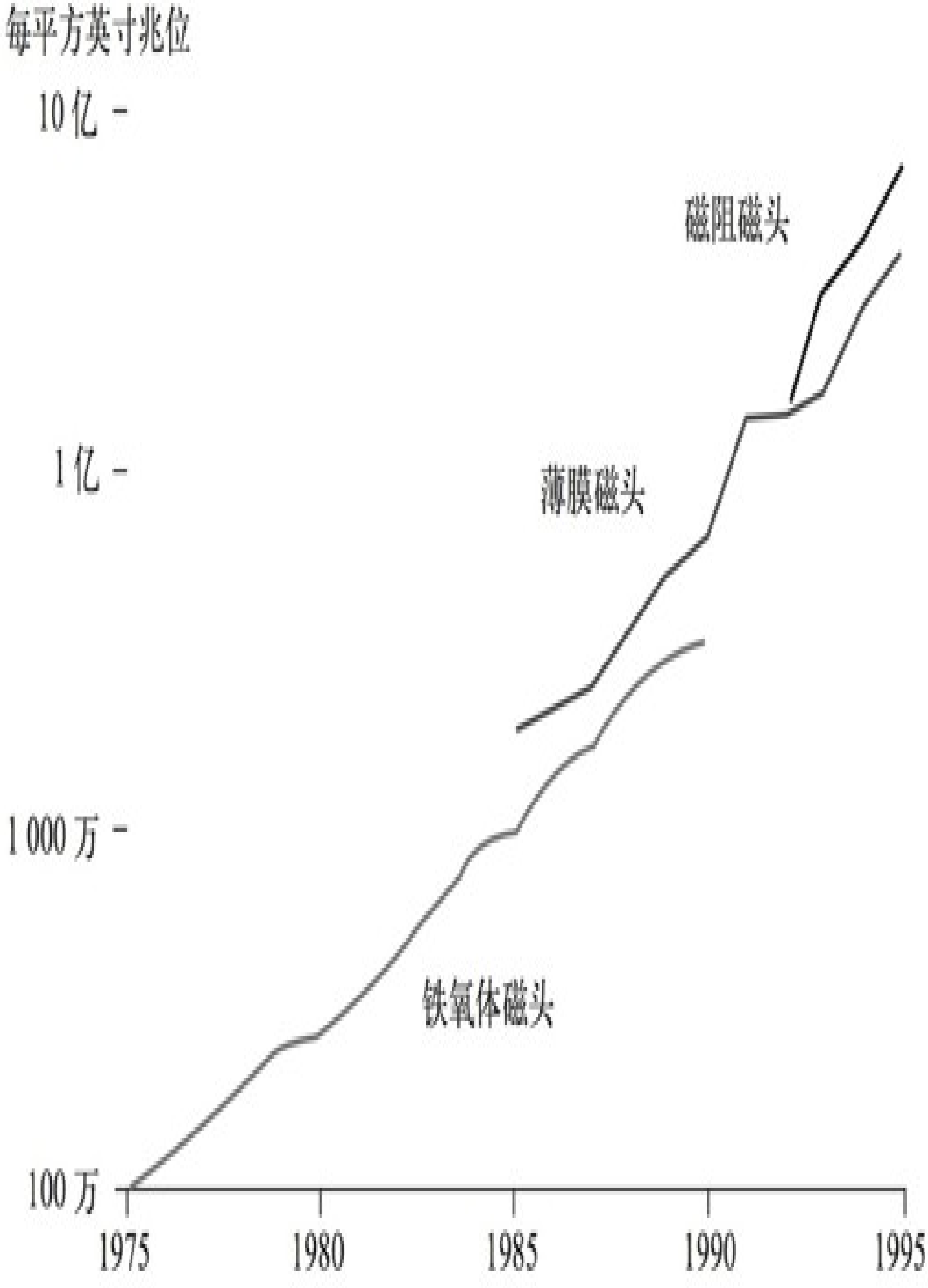
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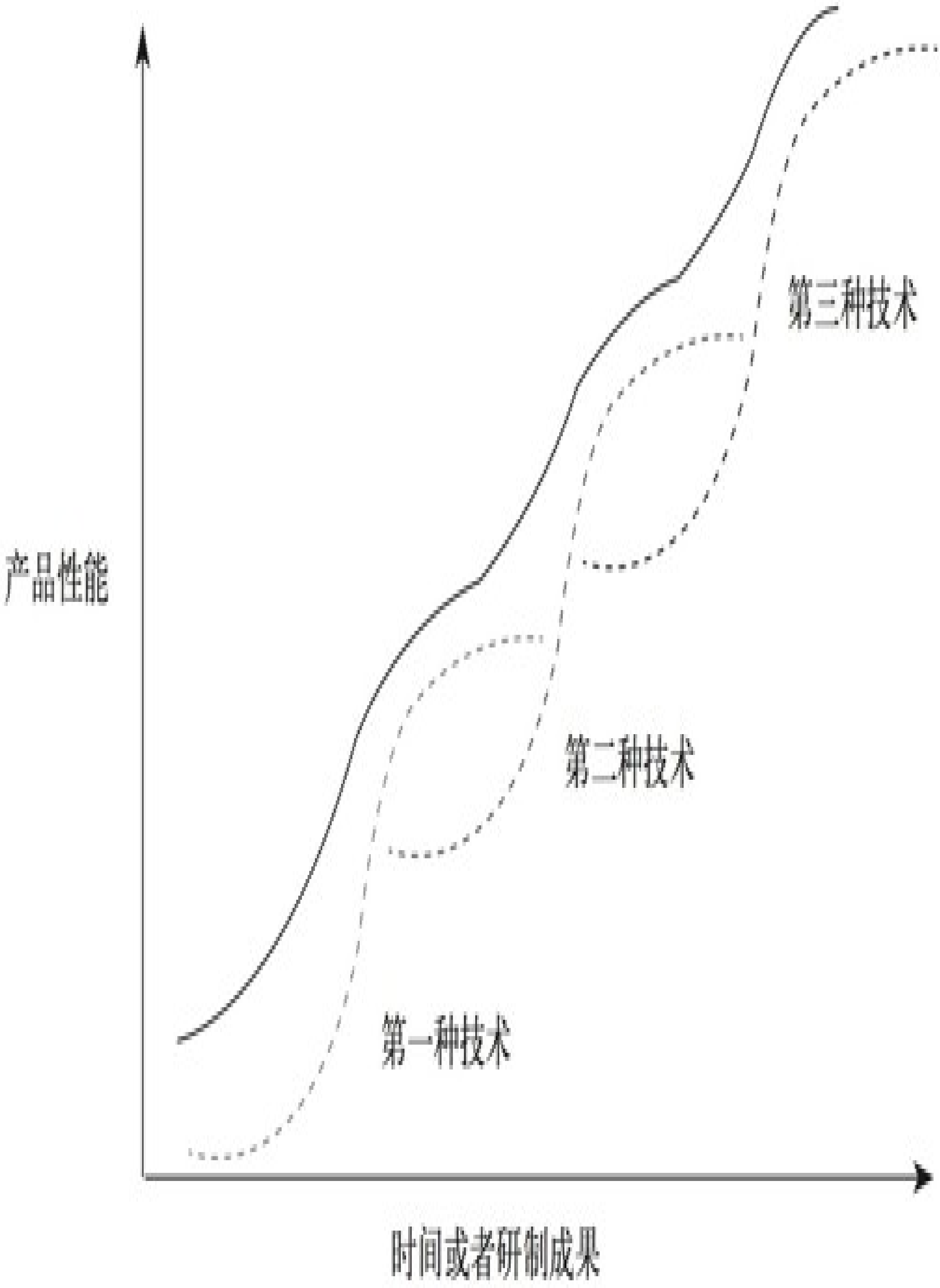
每平方英寸兆位
10亿
1亿
1 000万
100万
磁阻磁头
薄膜磁头
铁氧体磁头
1975
1980
1985
1990
1995

[illegible]8–5 [illegible]

[illegible]1975~1990[illegible]

[illegible]1985~1995[illegible]1993[illegible]

[illegible]8-6[illegible]S[illegible]



[illegible]8–6 [illegible]S[illegible]S[illegible]

[illegible]50%[illegible]50%[illegible]50%[illegible]

[illegible]

[illegible]5[illegible]

[illegible]

[illegible]

[illegible]·[illegible]1965[illegible]·[illegible]50[illegible]3000[illegible]1965[illegible]

[illegible]DNA[illegible]

[illegible]——[illegible]

[illegible] [illegible]
[illegible]

[illegible]

[illegible]·[illegible]

[illegible]4[illegible]8.5[illegible]2000[illegible]

[illegible]

[illegible]·[illegible]

[illegible]

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[illegible]·[illegible]——[illegible]

[illegible]

[illegible]

[illegible]1964[illegible]100[illegible]45[illegible]1964[illegible]Skype[illegible]——[illegible]



[illegible]9–1 [illegible]1964[illegible]

[illegible]—[illegible]

[illegible]

[illegible]1878[illegible]1938[illegible]1964[illegible]10[illegible]500[illegible]

[illegible]50[illegible]

[illegible]1[illegible]2[illegible]—[illegible]·[illegible]Langdon Winner[illegible]

[illegible]

[illegible]—[illegible]

[illegible]—[illegible]—[illegible]

[illegible]

[illegible]——[illegible]——[illegible]

[illegible]

[illegible]

[illegible]4[illegible]8.5[illegible]4[illegible]8.5[illegible]4[illegible]8.5[illegible]4[illegible]8.5[illegible]2000[illegible]

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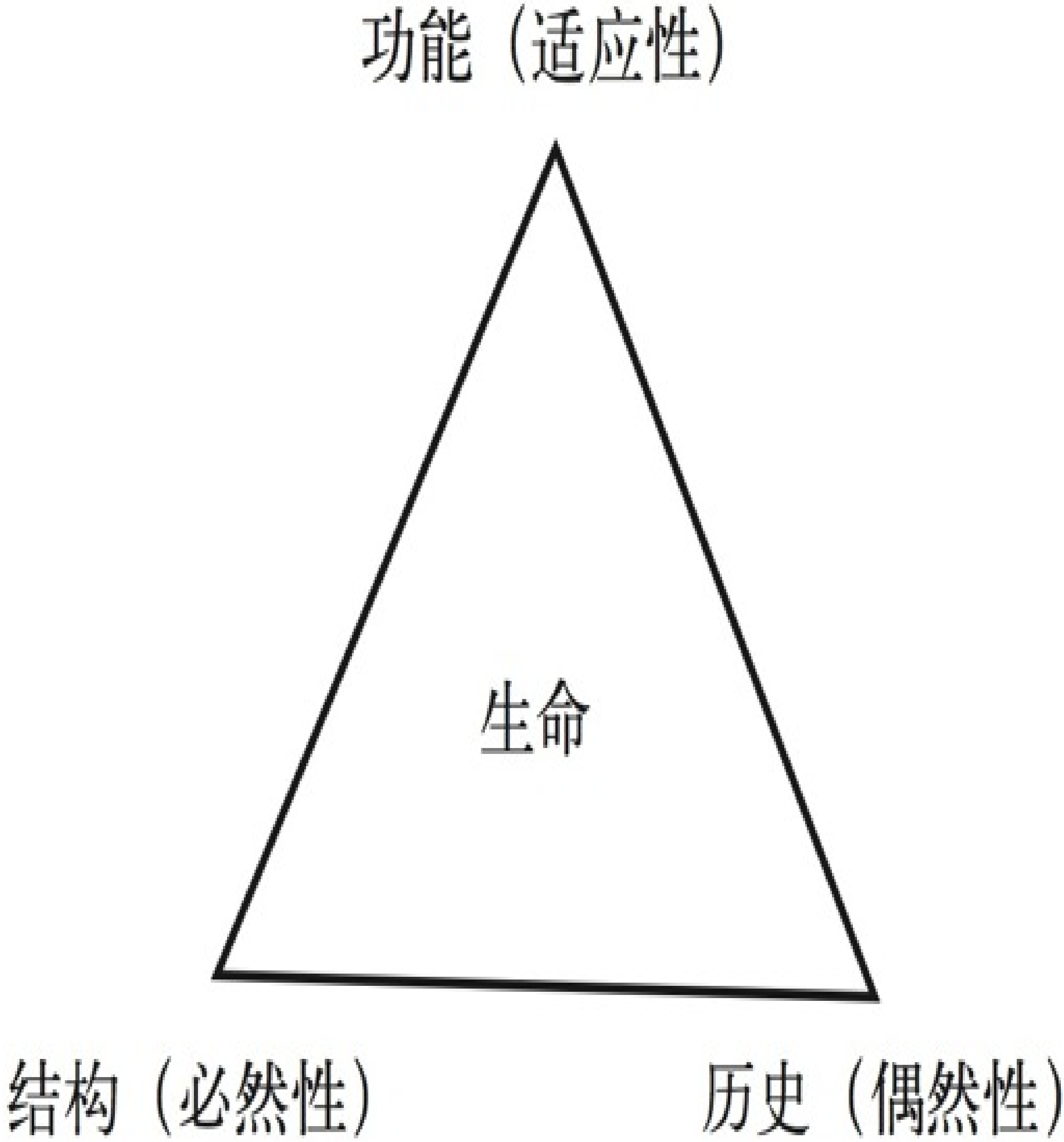
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[illegible]·[illegible]David Apter[illegible]·[illegible]

[illegible]

[illegible]92[illegible]

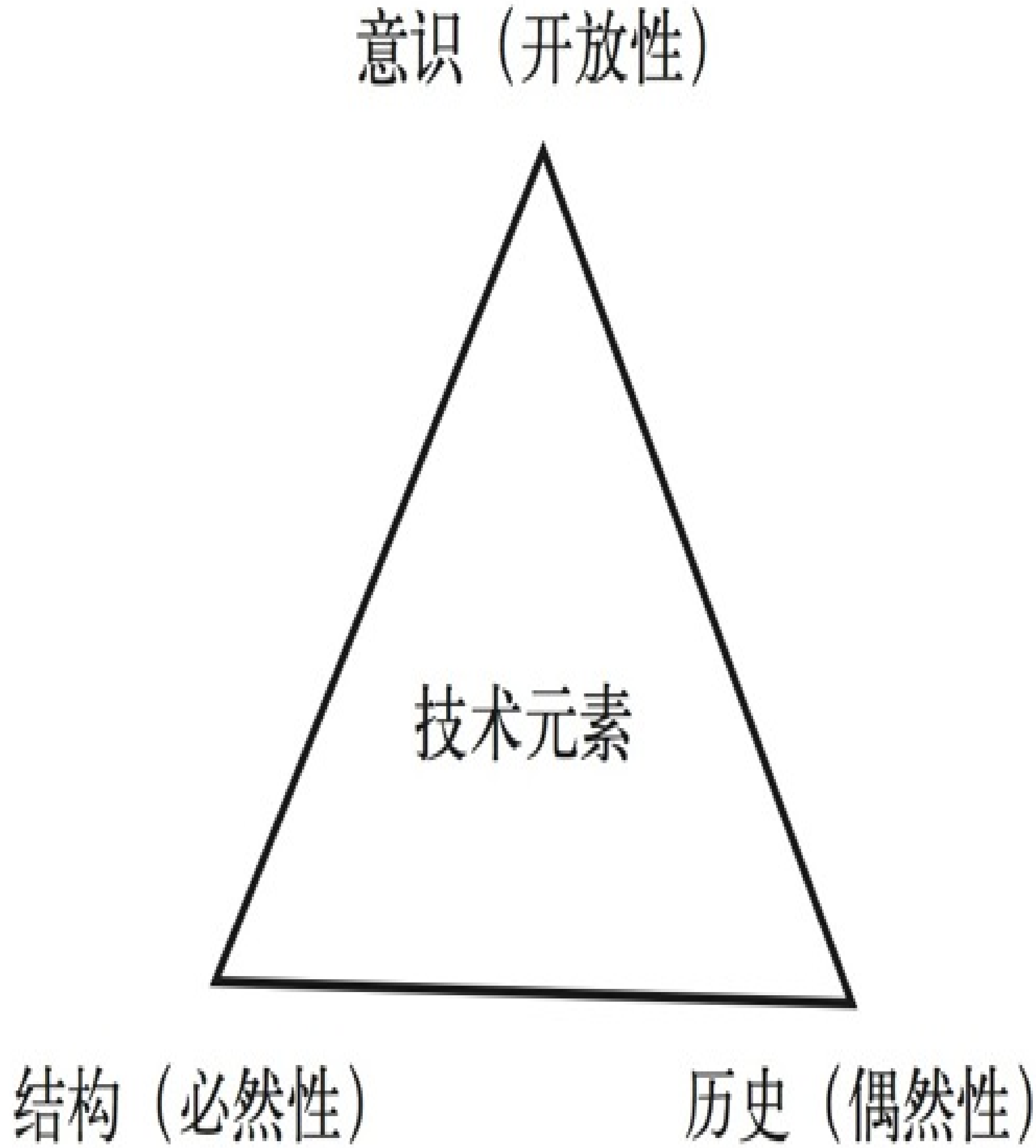
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[illegible]9–2 [illegible]

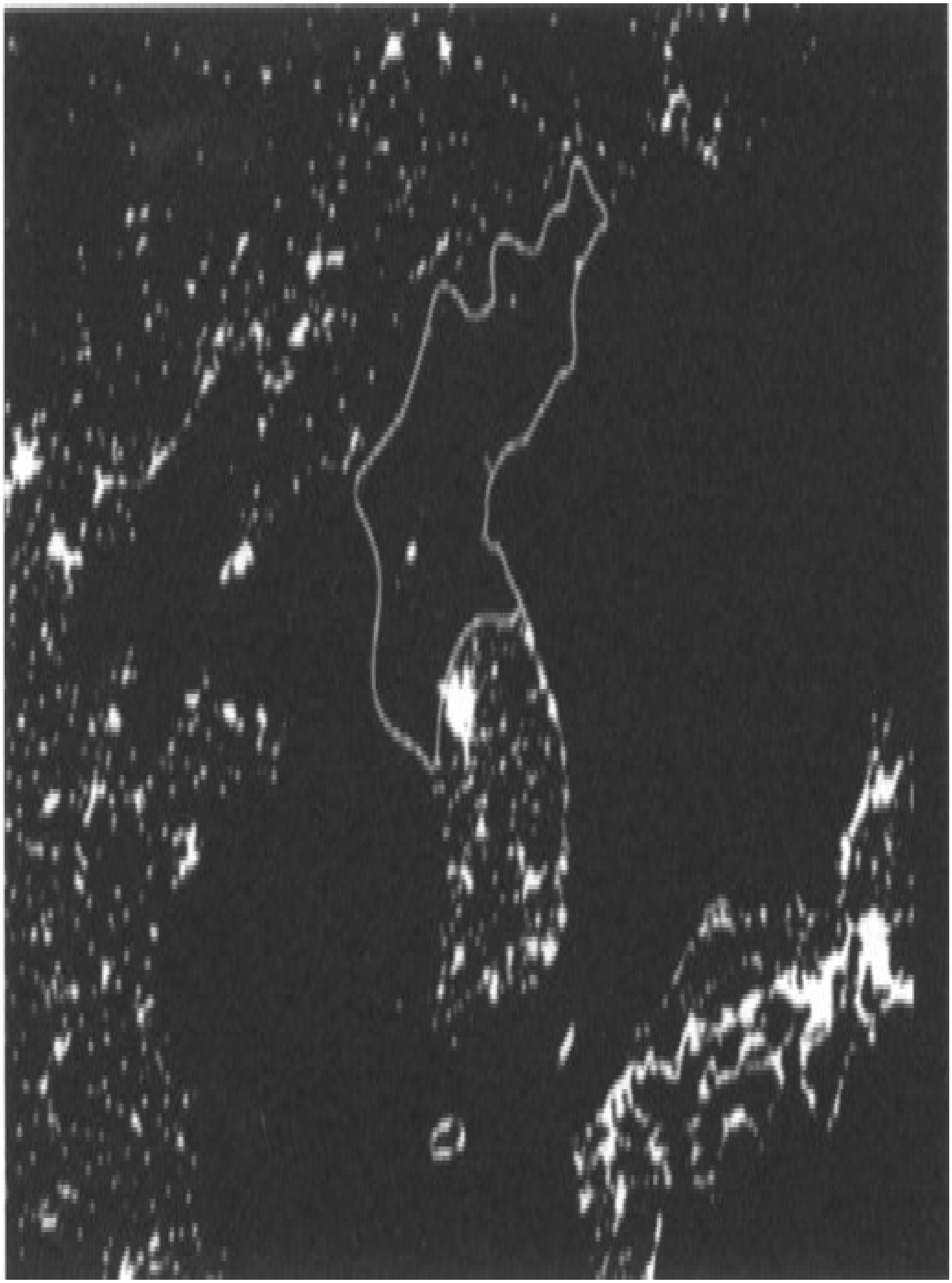
[illegible]—[illegible]9-2[illegible]

[illegible]—[illegible]9-3[illegible]


意识（开放性）
技术元素
结构（必然性）
历史（偶然性）

[illegible]

[illegible]



[illegible]9–4 [illegible]

[illegible]·[illegible]Paul Romer[illegible]

[illegible]

[illegible]

[illegible]Nonzero[illegible]·[illegible]Robert Wright[illegible]—[illegible]—[illegible]10[illegible]100%[illegible]DNA[illegible]

[illegible]

[illegible]DNA[illegible]

[illegible]

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[illegible]—[illegible]—[illegible]

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[illegible]·[illegible]

[illegible]

1917[illegible]·[illegible]—[illegible]·[illegible]1904[illegible]·[illegible]

[illegible]·[illegible]1000[illegible]1893[illegible]·[illegible]1912[illegible]·[illegible]·[illegible]1925[illegible]

19[illegible]90[illegible]·J·[illegible]

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10 [illegible] 2000 [illegible] 2000 [illegible] 4 [illegible] 200 [illegible] 5% [illegible] 5 [illegible]

[illegible] X [illegible] Y [illegible] · [illegible]

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> [illegible]5 000[illegible]

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[illegible] 35 000 [illegible]

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[illegible] — [illegible]

[illegible] 16 [illegible] 3 [illegible] 23 [illegible] — [illegible]

[illegible]

[illegible] 3 [illegible]

[illegible]

[illegible]

- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]

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[illegible]

[illegible]——[illegible]

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[illegible]·[illegible]——[illegible]FC [illegible]

[illegible]

[illegible]

[illegible]25[illegible]——[illegible]



□10–1 □□□□□□□□□□□

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[illegible]

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[illegible]

[illegible]

[illegible]·[illegible]

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[illegible] 1 [illegible]

[illegible]

[illegible] 25 [illegible]

[illegible]

[illegible]·[illegible]

[illegible]

[illegible]

[illegible]—[illegible]

[illegible]

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[illegible]

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[illegible]——[illegible]——[illegible]

[illegible]

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2. [illegible]——[illegible]
3. [illegible]——[illegible]
4. [illegible]Freedom Club[illegible]——[illegible]

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[illegible]

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[illegible]——[illegible]4%[illegible]

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[illegible]

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[illegible]—[illegible]—[illegible]

[illegible]iPhone[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] LED [illegible]

[illegible] 110 [illegible] 100 [illegible] 18 [illegible] 460V8 [illegible] 500 [illegible] — [illegible]

[illegible]

[illegible]

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1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]

[illegible]——[illegible]

[illegible]

[illegible]

[illegible]8[illegible]30[illegible]

[illegible]——[illegible]

[illegible]——[illegible]

[illegible]

[illegible]·[illegible]Better Off[illegible]

[illegible]·[illegible]·[illegible]The Gift of Good Land[illegible]

[illegible]……[illegible]

[illegible]

[illegible]

[illegible]6[illegible]1[illegible]……[illegible]

[illegible]=[illegible]300[illegible]2~3[illegible]

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[illegible]——[illegible]1[illegible]1[illegible]——[illegible]1940[illegible]·[illegible]·[illegible]Alan Kay[illegible]1940[illegible]

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[illegible]1950[illegible]·[illegible]

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[illegible]

[illegible]

[illegible]·[illegible]

[illegible]

[illegible]

[illegible]

1. [illegible]——[illegible]
2. [illegible]——[illegible]
3. [illegible]20[illegible]——[illegible]
4. [illegible]——[illegible]
5. [illegible]——[illegible]

[illegible] [illegible]
[illegible]

[illegible]

[illegible]

[illegible]

[illegible]·[illegible]

[illegible]200[illegible]

[illegible]

[illegible]1992[illegible]

[illegible]·[illegible]DDT[illegible]60[illegible]DDT[illegible]50[illegible]DDT[illegible]

[illegible]

·

Paul Valery

4 1

CD CD

—

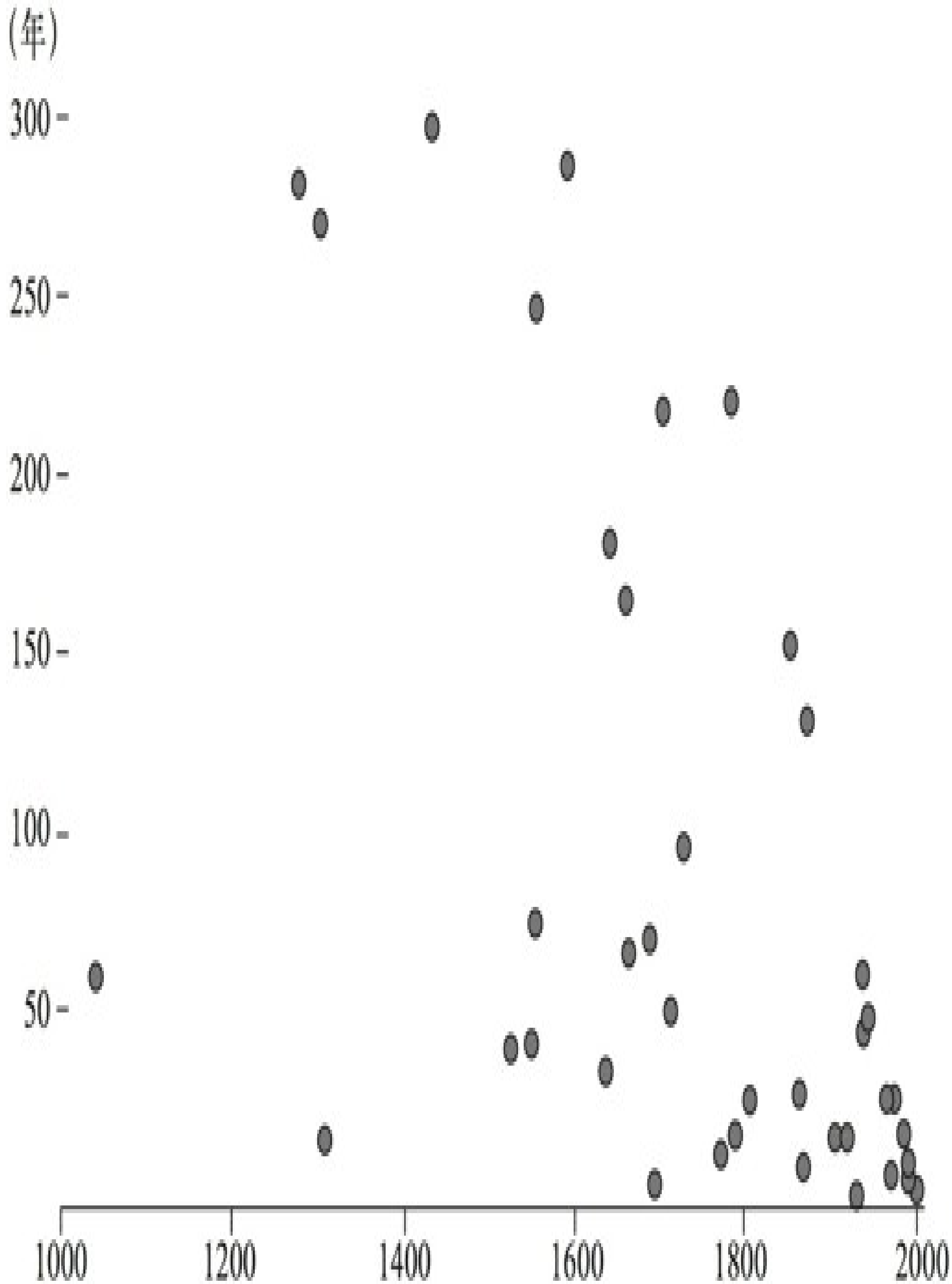
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[illegible]1 000[illegible]40[illegible]
1000[illegible]1000[illegible]40[illegible]

[illegible]3[illegible]200[illegible]20[illegible]

[illegible]12-1[illegible]

[illegible]—[illegible]



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[illegible]1299[illegible]

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[illegible]

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[illegible]100[illegible]T[illegible]1[illegible]100[illegible]——[illegible]

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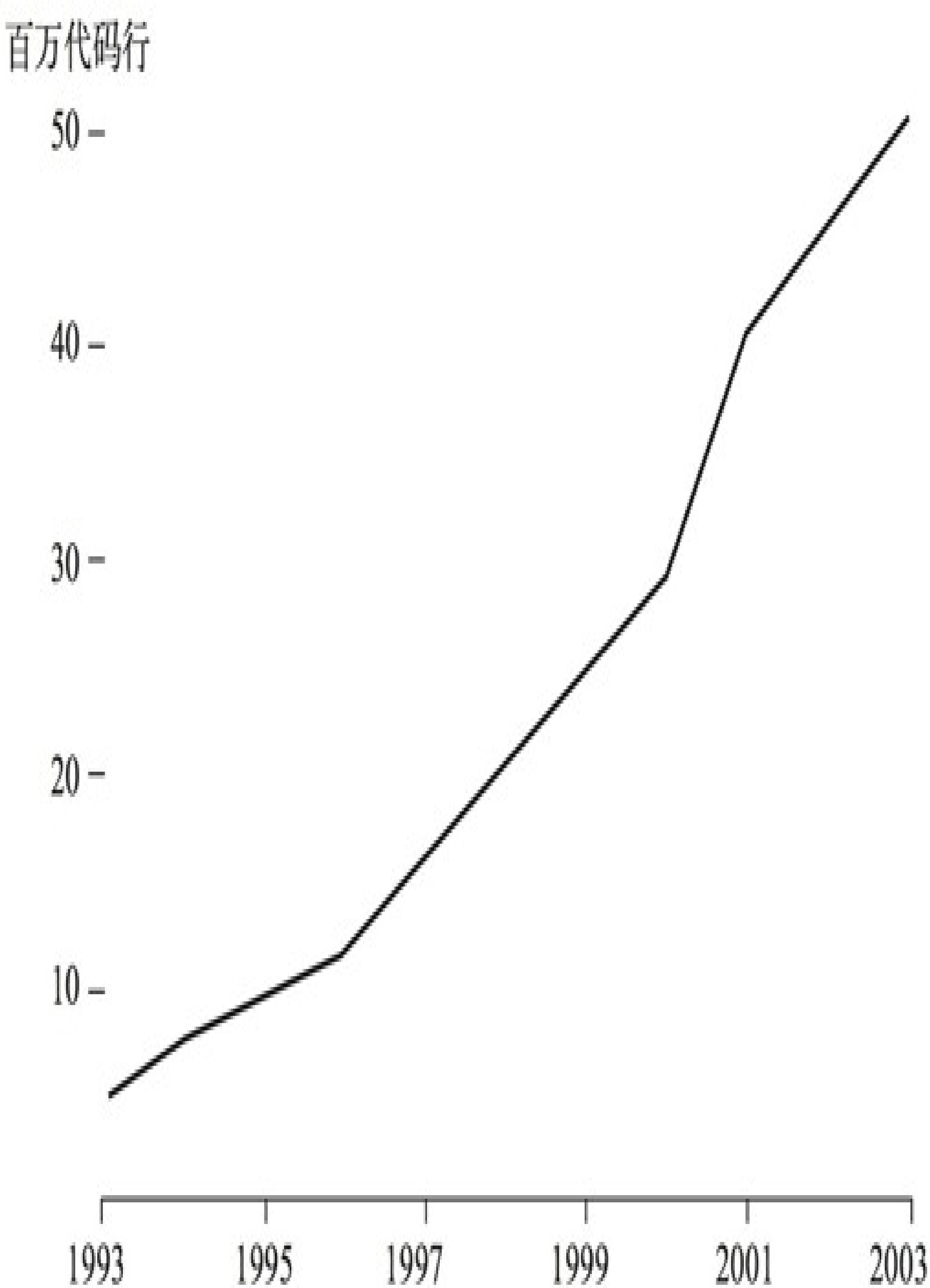
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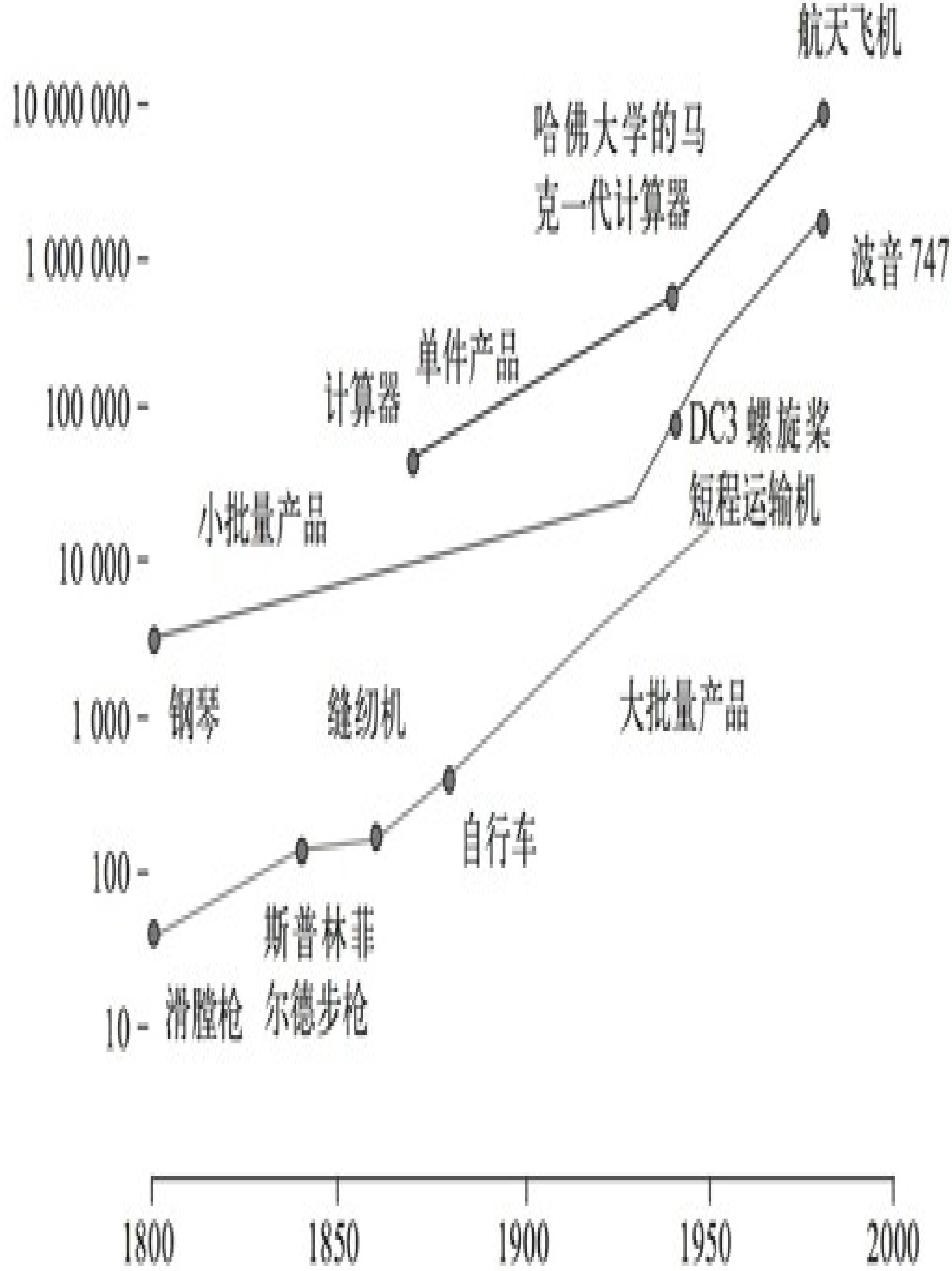
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波音 747
单件产品
计算器
DC3 螺旋桨
短程运输机
小批量产品
钢琴
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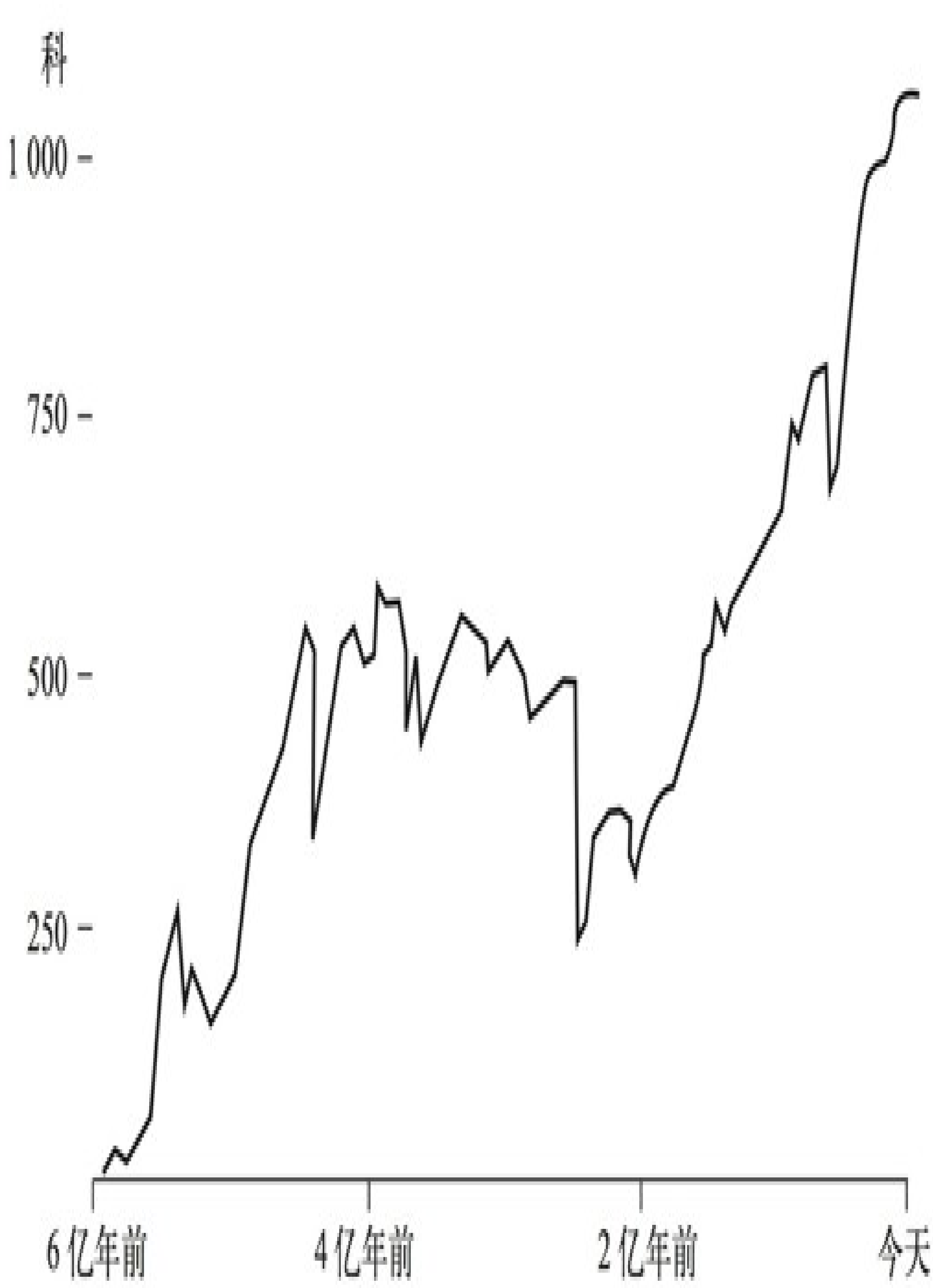
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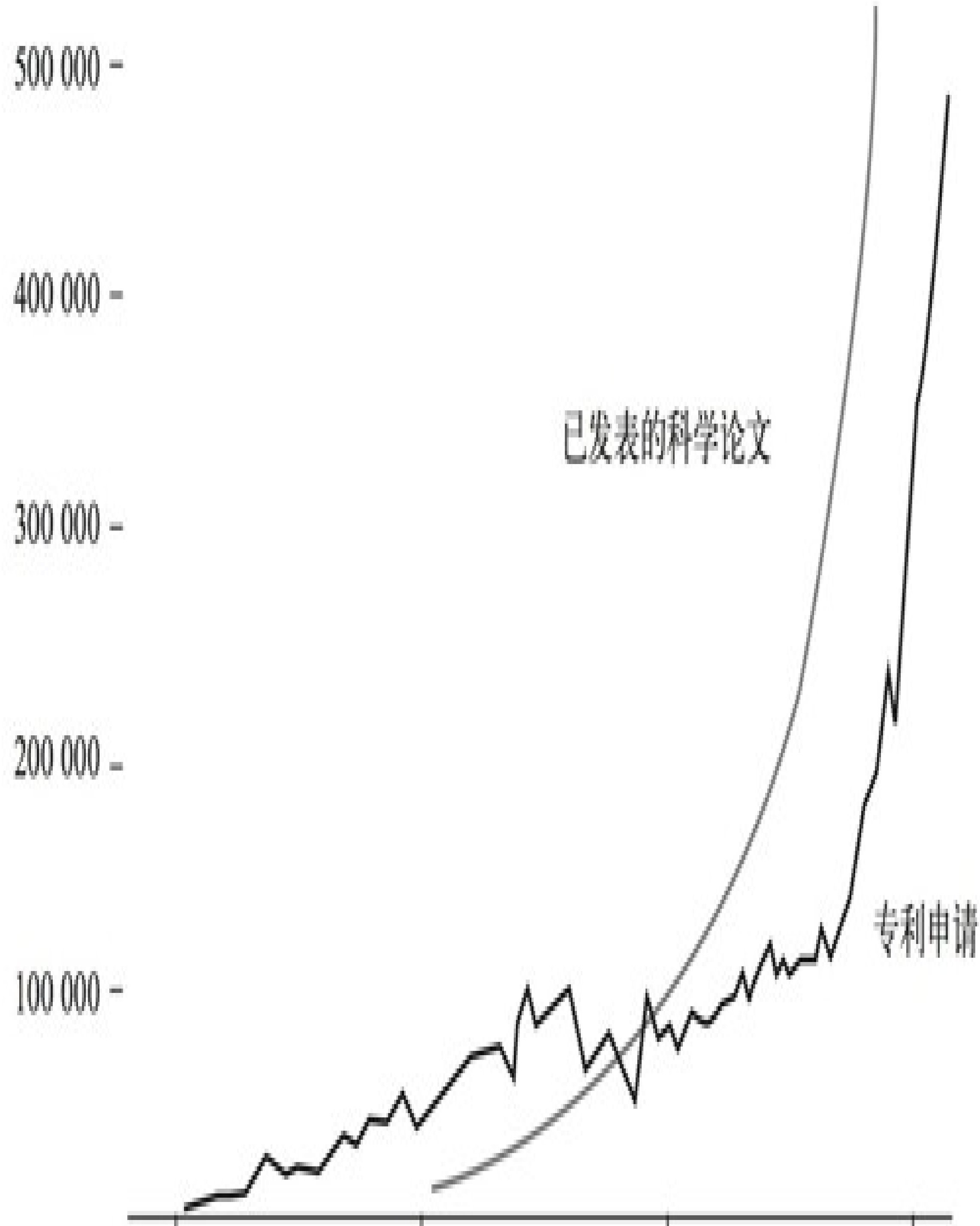
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400 000
300 000
200 000
100 000
已发表的科学论文
专利申请
1850
1900
1950
2000

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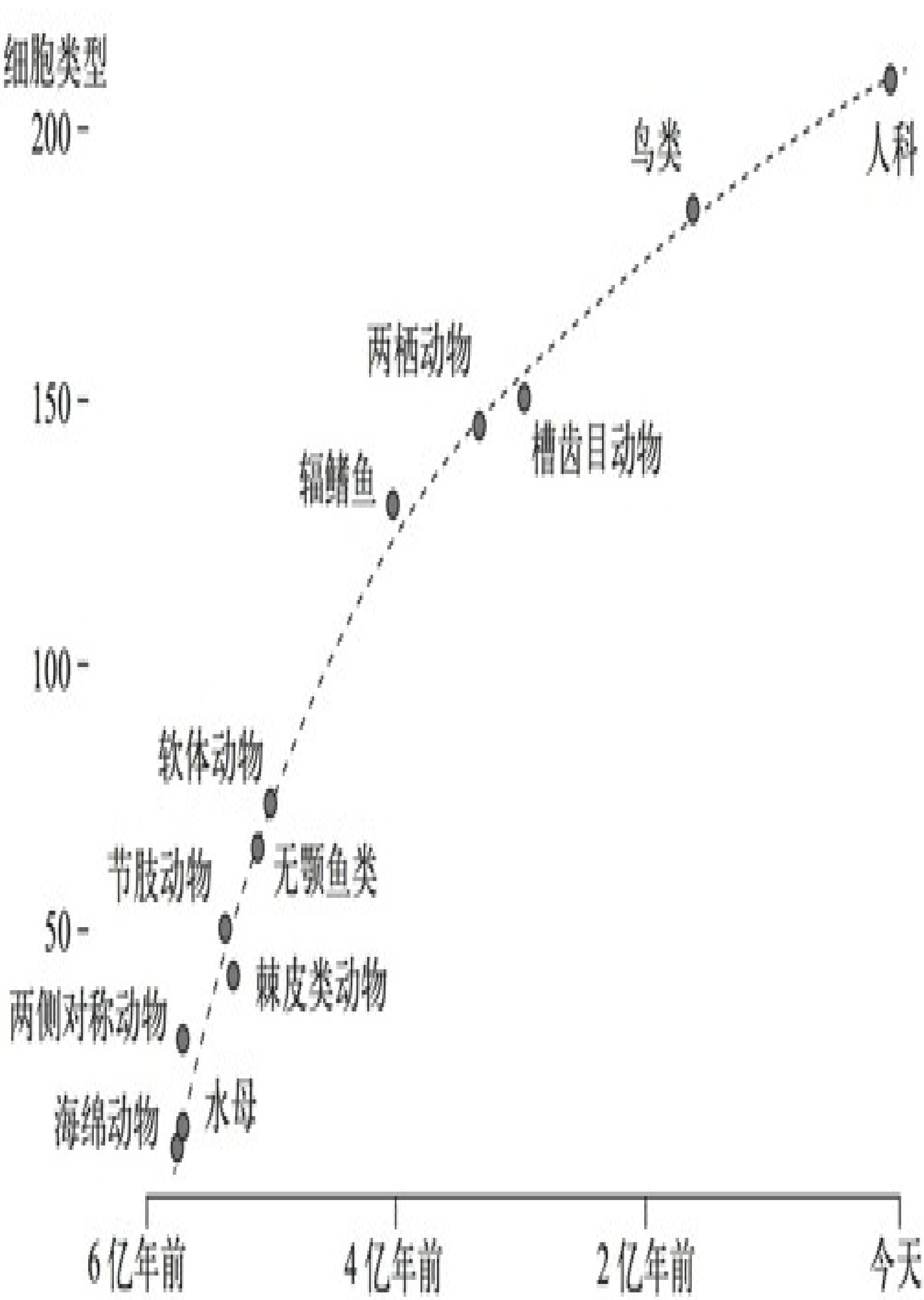
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细胞类型
200
150
100
50
人科
鸟类
两栖动物
槽齿目动物
辐鳍鱼
软体动物
节肢动物
无颚鱼类
棘皮类动物
两侧对称动物
海绵动物
水母
6亿年前
4亿年前
2亿年前
今天

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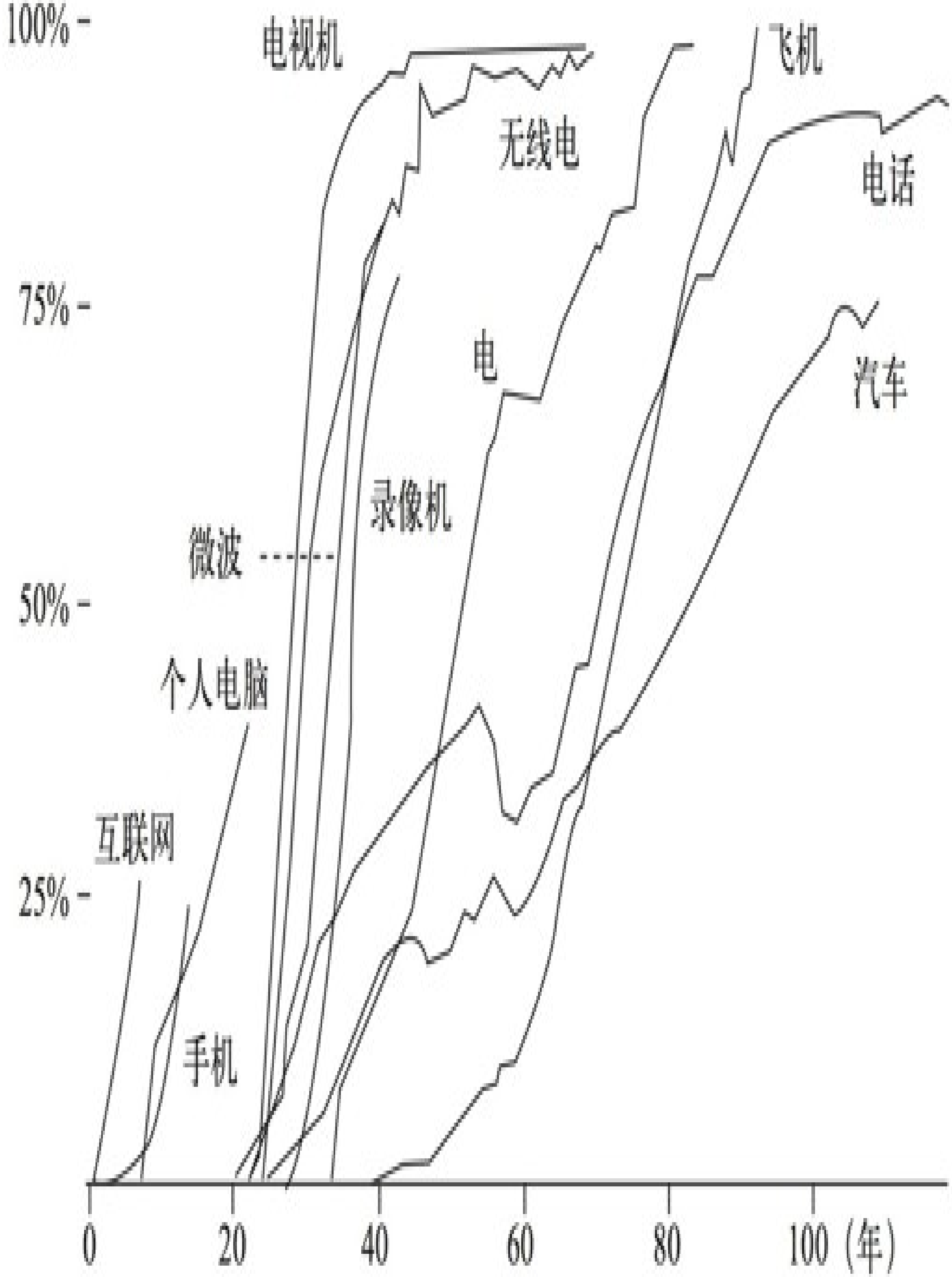
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100%
75%
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25%
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无线电
飞机
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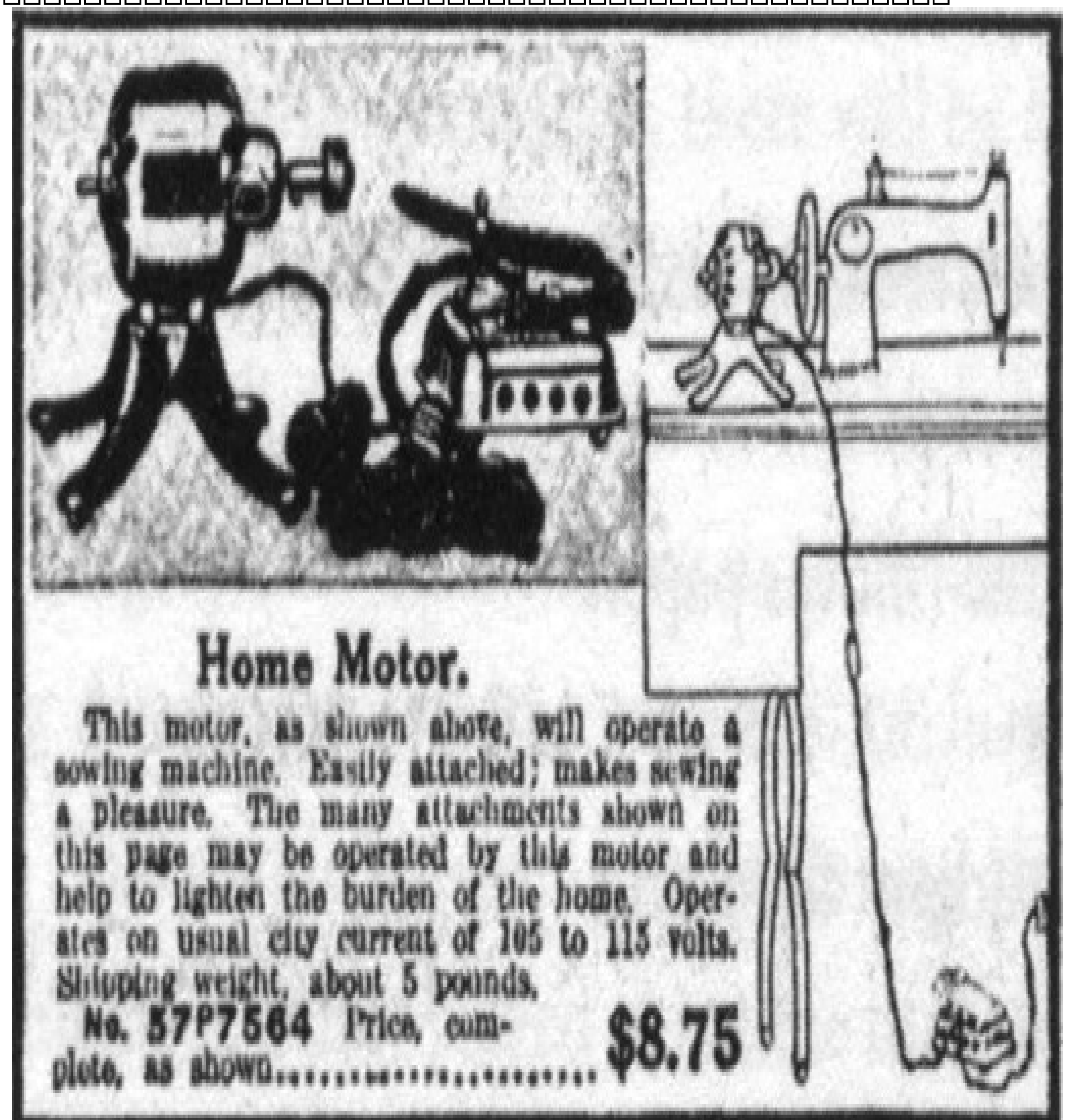
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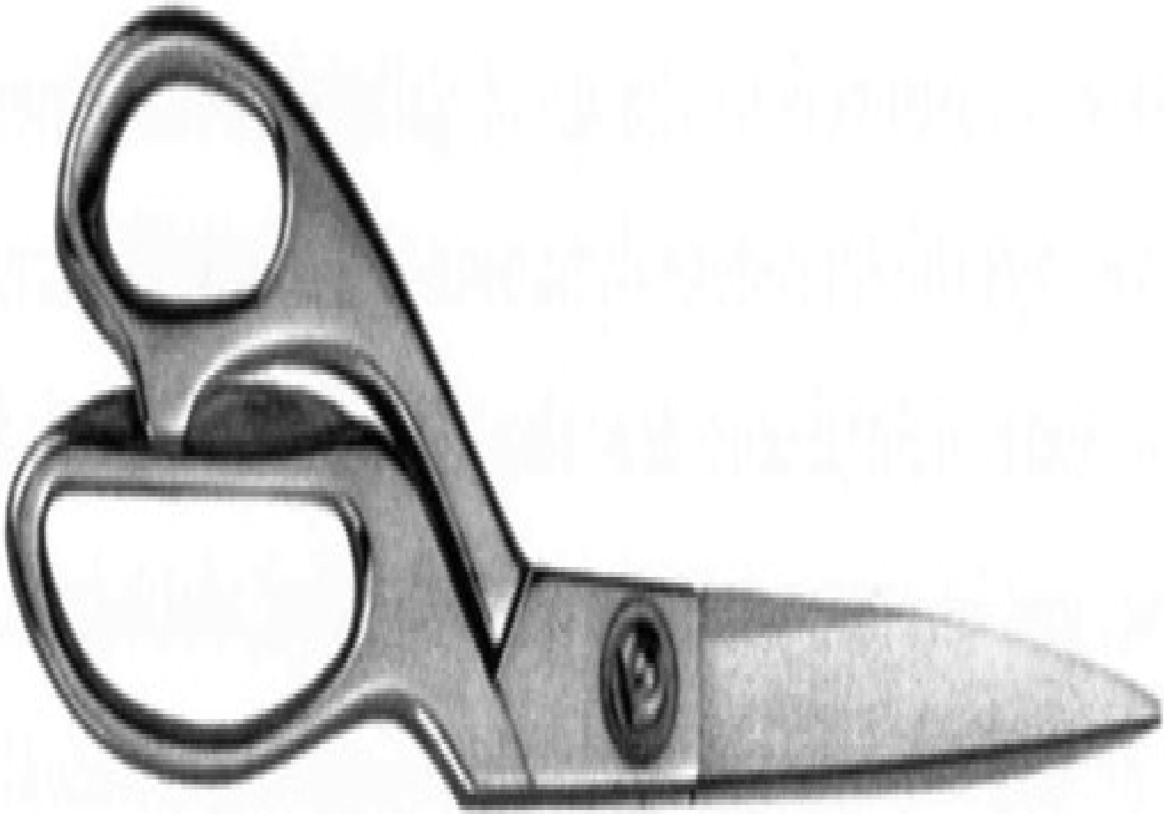
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2. [illegible]——[illegible]
3. [illegible]——[illegible]
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[illegible]——[illegible]·[illegible]Loren Eiseley[illegible]

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[illegible]·[illegible]Carl Sagan[illegible]40[illegible]

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[illegible]·[illegible]Camille Cloutier[illegible]

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[illegible]·[illegible]John Brockman[illegible]6[illegible]

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[illegible]·[illegible]Russ Mitchell[illegible]·[illegible]Michael Dowd[illegible]·[illegible]Peter Schwartz[illegible]·[illegible]Charles Platt[illegible]·[illegible]Andreas Lloyd[illegible]·[illegible]Gary Wolf[illegible]·[illegible]Howard Rheingold[illegible]

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